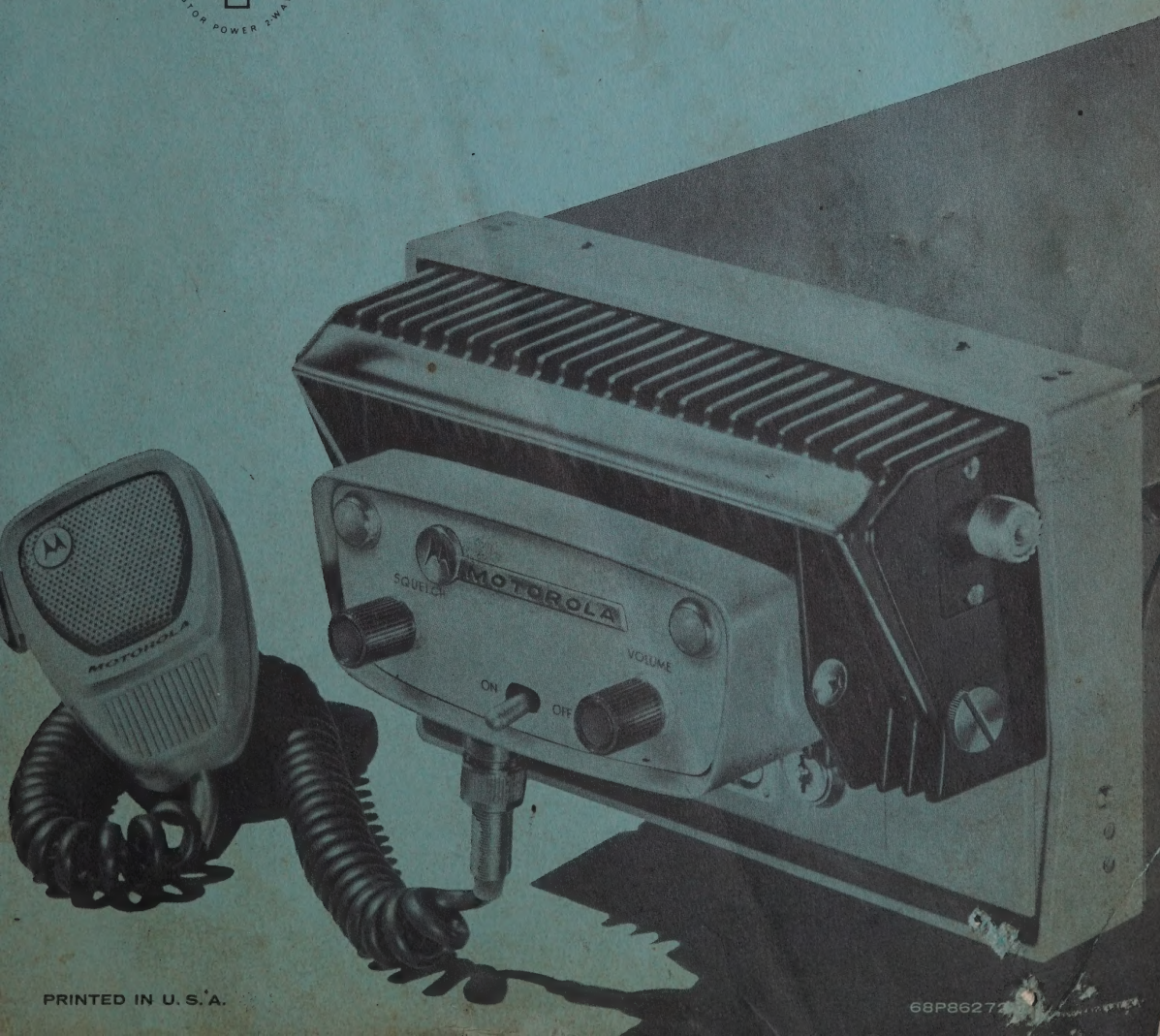
Mobile FM Two-Way Radio

25-54 MC 50 W RF POWER 12 VDC



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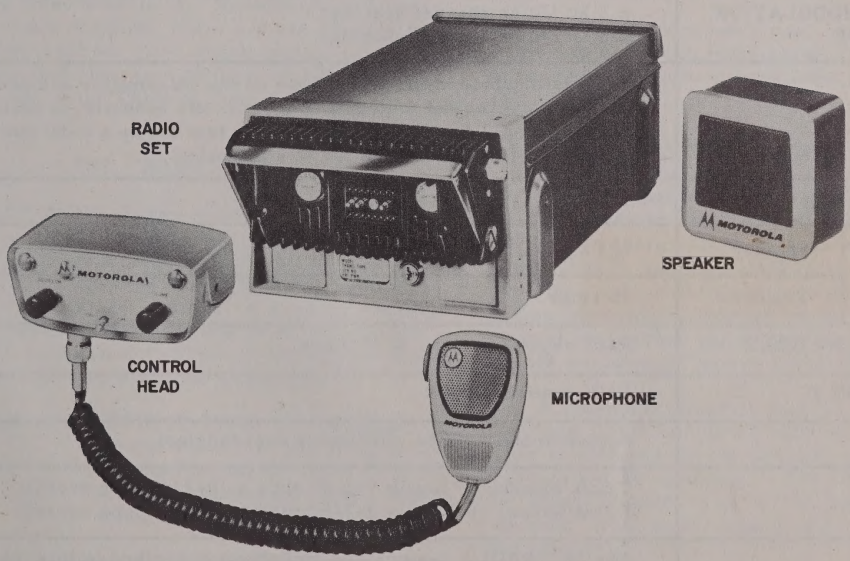
MOTOROLA

"T-POWER" MOBILE

FM TWO-WAY RADIO

50 W RF POWER
25-54 MC
12 VDC



AEPD-1403-O (MC3971)

MOTOROLA INC. COMMUNICATIONS DIVISION
Engineering Publications 4501 W. Augusta Blvd. Chicago 51, Illinois

Printed in U.S.A.
11/5/59-RCS

68P862725
Issue - A

GUARANTEED PERFORMANCE SPECIFICATIONS

MODELS		U51GGT-1000 Series
INSTALLATION		Front Mount or Trunk Mount
FREQUENCY		25-54 mc
TRANSMITTER RF POWER OUTPUT		50 watts minimum
TRANSMITTER MODULATION		40F3: ±15 kc for 100% at 1000 cps or 20F3: ± 5 kc for 100% at 1000 cps
RECEIVER SENSITIVITY		Less than 0.3 microvolt for 20 db quieting 50 ohms RF input impedance
RECEIVER SELECTIVITY		-100 db at ±15 kc (20 kc channel spacing) -100 db at ±32 kc (40 kc channel spacing)
RECEIVER MODULATION ACCEPTANCE		± 5 kc (20 kc channel spacing) ±15 kc (40 kc channel spacing)
METERING		Chassis mounted metering sockets on the transmitter and receiver facilitate convenient metering of all circuits essential to tuning and checking. A MOTOROLA portable test set or a 0-50 microampere meter can be used for this purpose.
INPUT VOLTAGE		12 VDC Positive or Negative Ground
CURRENT DRAIN (TOTAL)	Standby	6.1 amps
	Transmit	16 amps
INTERMITTENT DRAIN		Each crystal heater: 0.65 amps
POWER SUPPLY		Fully transistorized
WEIGHT		Approximately 47 lbs. (including accessories)
DIMENSIONS		Trunk Mount: 6" high x 9-7/8" wide x 19-1/4" long overall Front Mount: 6" high x 9-7/8" wide x 20-3/4" long overall
LICENSING INFORMATION		The MOTOROLA 2-way radio equipment described in this manual meets or exceeds all requirements for FCC licensing, and is included in the FCC "List of Equipment Acceptable for Licensing in the Radio Services other than Broadcast". Identification of "Transmitter Type" (XMTR TYPE) appears on the equipment nameplate and on the transmitter chassis and is: Type Number.....CC1008 (25-54 MC) for licensing under FCC rule parts 10, 11, 16, and 21.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

FOREWORD

PURPOSE OF THE MANUAL

This manual offers the serviceman complete installation, operation, maintenance and service information on the MOTOROLA 2-way radio models described in it.

The manual will serve as a ready reference for the experienced technician and also as a step-by-step guide for the inexperienced man.

For convenience and quick reference, the manual is divided into separate sections. Each section has complete alignment, service and maintenance information on its chassis and/or kits and includes its own diagrams, details and parts lists. For example, the Receiver section contains complete information on the receiver models described in it. Installation and operation of the complete radio set are covered in a separate section. All major section paragraph headings and diagrams are listed for the serviceman's use in the Table of Contents.

THE "RADIO SET"

MOTOROLA 2-way radio equipment is packaged as a radio set plus accessories. The radio set is assigned a model number for identification purposes. It includes the transmitter, receiver, and power supply chassis in a single housing. This model number describes the package specifically. Use the model number in its entirety when making inquiries about the equipment.

Example: U51GGT-1000A - describes a trunk mount, 25-54 mc, 40 kc channel spaced set with a 50 watt, one frequency transmitter, and a transistorized power supply.

It is evident that the model number is easier to use and is more specific than a word description.

The accessories are identified by an accessory group number which includes those other items essential to completing the radio installation such as; antenna, speaker, cables, etc. Use this number when referring to a specific group of accessories.

Example: DA1100C - describes an accessory group which includes a one-frequency control head and microphone, 12 v d-c cable kit, installation kit for a 10-inch housing, antenna, and a speaker.

In addition to these model and group numbers, Motorola has assigned identifiers to all chassis and kits. These are for inventory and stock control purposes and should be used by the serviceman when requesting information on them or when ordering replacements. Use the assigned number identifiers. It will be to your benefit. These are the only sure means of describing the radio equipment and its many parts.

The radio set model number is metal stamped on the equipment nameplate along with the transmitter type number, serial number and type of primary power. Chassis and kit numbers are rubber stamped on the chassis or kit itself.

For the serviceman's use, breakdown cross reference charts on radio set models and accessory groups are located in the front matter section of the manual.

PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision numeral is assigned to the chassis or kit affected, e.g.; TA234 becomes TA234-1, with the first revision. This chassis number complete with revision numeral is stamped on the chassis at the time of production, and the revision numeral becomes an integral part of the chassis identifier.

A schematic diagram number complete with its issue letter is also stamped on each chassis. This establishes direct correlation between the chassis and its schematic. The schematic issue is advanced each time a change occurs in the chassis. The most recent issue is stamped on the chassis.

INSTRUCTION MANUAL REVISION BULLETINS

Those changes which occur after an instruction manual is printed are covered by the Instruction Manual Revision Bulletins. These bulletins give the reader complete information on the change including pertinent parts listing data from which the instruction manual can be corrected.

NATIONAL SERVICE ORGANIZATION

Motorola is a nation-wide service organization. Through its maintenance and installation

program Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.

The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations, manned with several thousand F. C. C. Licensed Personnel constitute the sub-contracting force.

The administrative forces of area and district service managers and district service representatives are in the direct employ of Motorola.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
4501 W. Augusta Blvd.
Chicago 51, Illinois

REPLACEMENT PARTS ORDERING

MOTOROLA maintains parts and service depots in Dallas, Texas, and Burlingame, California, to supplement the activities of the Parts and Service Department in Chicago. The table outlines the services provided by these facilities:

Factory: Crystal Service Department,
916 N. Kilbourn Ave.,
Chicago 51, Illinois

Chicago Parts and Service Department:
4910 West Flournoy Street
Chicago 44, Illinois

Dallas Parts Depot:
7138 Envoy Court,
Dallas 35, Texas

Burlingame Parts Depot:
1616 Rollins Road,
Burlingame, California

Area Served	Parts & Service	Crystals	Resonant Reeds
Central and Eastern area	Chicago Parts Dept	Factory	Factory
Southern area	Dallas	Factory	Dallas
Western area	Burlingame	Factory	Burlingame

These offices are fully equipped to give this service. When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and insure receipt of the desired item. Complete number identification should also be used when requesting equipment information.

Crystal orders should specify crystal type number, crystal frequency, carrier frequency and the chassis model number in which the crystal is to be used.

Orders for "Vibrasender" and "Vibrasponder" Resonant Reeds should specify the type number and frequency and should identify the owner and operator of the "private-line" network in which these items are to be used.

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY SUGGESTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED RADIO EQUIPMENT.

THE EQUIPMENT DESCRIBED IN THIS MANUAL IS MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING MOTOROLA U. S. PATENTS:

				2,830,200
RE-24,110	2,547,027	2,688,059	2,759,052	2,833,994
D,159,182	2,566,759	2,691,094	2,759,103	2,834,879
2,343,115	2,583,032	2,691,560	2,770,721	2,835,794
2,404,359	2,602,842	2,699,425	2,777,950	2,846,596
2,439,408	2,608,648	2,705,281	2,784,263	2,852,730
2,439,412	2,608,649	2,713,664	2,799,001	2,860,239
2,459,675	2,626,384	2,731,555	2,799,010	2,864,943
2,472,021	2,636,652	2,738,466	2,799,832	2,883,521
2,524,300	2,637,782	2,740,891	2,808,507	2,888,652
2,524,534	2,650,333	2,743,144	2,809,236	2,899,547
2,547,023	2,652,542	2,743,361	2,810,068	2,901,601
2,547,025	2,662,942	2,750,451	2,811,590	2,905,909

Other U. S. Patents Pending

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Single-Frequency Receiver Schematic Diagram, Parts Location Detail and Parts List	63E854952
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MOTOROLA

MODEL CHART
RADIO SET

CARRIER SQUELCH "T" POWER MODELS

25 - 54 MC 12 VDC OPERATION

CODE:

- [X] = ITEM INCLUDED IN RADIO SET
- [/] = ITEM INCLUDED WITH ORDERS FOR FIVE (OR LESS) RADIO SETS
- [◪] = ALTERNATE ITEMS DEPENDING UPON FREQUENCY RANGE
- [2] = TWO ITEMS SUPPLIED

*REPRESENTS A SERIES OF MODELS AND NOT A SPECIFIC MODEL. THE SPECIFIC MODEL, AS STAMPED ON THE CHASSIS, IS DETERMINED BY ITS APPLICATION.

MODEL	NO. OF RCVR. FR.	NO. OF XMTR. FR.	CHANNEL SPACING	ACCESSORY GROUPS
U51GGT-1000A	1	1	40 KC	DA, DB, DE OR DF
U51GGT-1010A	1	2	40 KC	DA, DB, DE OR DF
U51GGT-1030A	2	2	40 KC	DA, DB, DE OR DF
U51GGT-1100A	1	1	20 KC	DA, DB, DE OR DF
U51GGT-1110A	1	2	20 KC	DA, DB, DE OR DF
U51GGT-1130A	2	2	20 KC	DA, DB, DE OR DF

ITEM	DESCRIPTION	REFERENCE DIAGRAM	1000A	1010A	1030A	1100A	1110A	1130A
*TRB1080AA/TA235W	RECEIVER, 1-FREQUENCY, 40 KC CHANNEL SPACING (25-54 MC)	63E854952	X					
*TRB1080AC/TA235W-R2	RECEIVER, 2-FREQUENCY, 40 KC CHANNEL SPACING (25-54 MC)	63E854953		X				
*TRB1080AB/TA235S	RECEIVER, 1-FREQUENCY, 20 KC CHANNEL SPACING (25-54 MC)	63E854952			X			
*TRB1080AD/TA235S-R2	RECEIVER, 2-FREQUENCY, 20 KC CHANNEL SPACING (25-54 MC)	63E854953				X		
*TTB1030AA/TA234	TRANSMITTER, 1-FREQUENCY (25-54 MC)	63E854612					X	X
*TTB1030AB/TA234-C2	TRANSMITTER, 2-FREQUENCY (25-54 MC)	63E854612	X	X	X	X	X	X
TU588	POWER SUPPLY	63E856462	X	X	X	X	X	X
TK603	SUB-PANEL KIT		X	X	X	X	X	X
TK661	FRONT PANEL KIT		X	X	X	X	X	X
K-9045	HOUSING	69D854784	X	X	X	X	X	X
K-9322	TUNING TOOL KIT	69A849899	/	/	/	/	/	/
RN3-A	TRANSMITTER CONTROL CRYSTAL		X	2	2	X	2	2
RM14A/RP14A	RECEIVER CONTROL CRYSTAL (25-40 MC)		◪	◪	◪	◪	◪	◪
RM15A/RP15A	RECEIVER CONTROL CRYSTAL (40-54 MC)		X	X	X	X	X	X
G04	RECEIVER I-F CRYSTAL				X			
TLN6155A	FILTER KIT, 2-FREQUENCY				X			

MOTOROLA

MODEL CHART

ACCESSORY GROUPS

CARRIER SQUELCH "T" POWER MODELS
25-54 MC 12VDC OPERATION

CODE:

[X] = ITEM INCLUDED

◪ = ALTERNATE ITEM DEPENDING UPON FREQUENCY RANGE

GROUP NUMBER	TYPE OF INSTALLATION	NO. OF FREQ'S	CONTROL HEAD	MICRO-PHONE	SPEAKER
DA1100C	REAR-MOUNT	ONE	"WIRED-IN" MIC.	SUPPLIED	3 OHM PM
DA1101C	REAR-MOUNT	ONE	"WIRED-IN" MIC.	SUPPLIED	POWER VOICE
DA1105B	REAR-MOUNT	ONE	WITH MIC. CONN.	LESS MIC.	3 OHM PM
DA1106B	REAR-MOUNT	ONE	WITH MIC. CONN.	LESS MIC.	POWER VOICE
DA1110C	REAR-MOUNT	TWO	"WIRED-IN" MIC.	SUPPLIED	3 OHM PM
DA1111C	REAR-MOUNT	TWO	"WIRED-IN" MIC.	SUPPLIED	POWER VOICE
DA1115B	REAR-MOUNT	TWO	WITH MIC. CONN.	LESS MIC.	3 OHM PM
DA1116B	REAR-MOUNT	TWO	WITH MIC. CONN.	LESS MIC.	POWER VOICE
DB1100C	FRONT-MOUNT	ONE	"WIRED-IN" MIC.	SUPPLIED	3 OHM PM
DB1105B	FRONT-MOUNT	ONE	WITH MIC. CONN.	LESS MIC.	3 OHM PM
DB1106B	FRONT-MOUNT	ONE	WITH MIC. CONN.	LESS MIC.	POWER VOICE
DB1110C	FRONT-MOUNT	TWO	"WIRED-IN" MIC.	SUPPLIED	3 OHM PM
DB1115B	FRONT-MOUNT	TWO	WITH MIC. CONN.	LESS MIC.	3 OHM PM
DB1116B	FRONT-MOUNT	TWO	WITH MIC. CONN.	LESS MIC.	POWER VOICE
DE1005AM	REAR-MOUNT	ONE	WITH MIC. CONN.	SUPPLIED	3 OHM PM
DF1005AM	FRONT-MOUNT	ONE	WITH MIC. CONN.	SUPPLIED	3 OHM PM
DE1015AM	REAR-MOUNT	TWO	WITH MIC. CONN.	SUPPLIED	3 OHM PM
DF1015AM	FRONT-MOUNT	TWO	WITH MIC. CONN.	SUPPLIED	3 OHM PM

ITEM	DESCRIPTION	REFERENCE DIAGRAM
TCN6001AA	CONTROL HEAD FOR "WIRED-IN" MIC., ONE-FREQ., REAR MOUNT	63E856475
TCN6001AE	CONTROL HEAD FOR "PLUG-IN" MIC., ONE-FREQ., REAR MOUNT	63E856475
TCN6001AB	CONTROL HEAD FOR "WIRED-IN" MIC., TWO-FREQ., REAR MOUNT	63E856475
TCN6001AF	CONTROL HEAD FOR "PLUG-IN" MIC., TWO-FREQ., REAR MOUNT	63E856475
TCN6000AA	CONTROL HEAD FOR "WIRED-IN" MIC., ONE-FREQ., FRONT MOUNT	63E856474
TCN6000AE	CONTROL HEAD FOR "PLUG-IN" MIC., ONE-FREQ., FRONT MOUNT	63E856474
TCN6000AB	CONTROL HEAD FOR "WIRED-IN" MIC., TWO-FREQ., FRONT MOUNT	63E856474
TCN6000AF	CONTROL HEAD FOR "PLUG-IN" MIC., TWO-FREQ., FRONT MOUNT	63E856474
TKN6006A	CABLE KIT, REAR MOUNT	
TKK11	CABLE KIT, FRONT MOUNT	
TU304-L	ANTENNA, 25-30 MC., REAR MOUNT	69D839216
TU304-H	ANTENNA, 30-54 MC., REAR MOUNT	69D839216
TU305-L	ANTENNA, 25-30 MC., FRONT MOUNT	69D839216
TU305-H	ANTENNA, 30-54 MC., FRONT MOUNT	69D839216
TU324A	3 OHM PM SPEAKER	69D845592
TU433A-12V	POWER VOICE SPEAKER	67C845846
TLN6000A	INSTALLATION KIT	
TLN6001A	MOUNTING KIT	
TLN6014A	6 TO 12 VOLT DC CONVERTER	
TKN6013A	CABLE KIT, REAR MOUNT	
TU353A	MICROPHONE	
TKN6014A	CABLE KIT, FRONT MOUNT	

DESCRIPTION

1. INTRODUCTION

The new MOTOROLA T-POWER mobile FM two-way radio sets incorporate several design features which reduce maintenance and provide full interchangeability between front and rear mount radio sets. These features are:

(1) transistorized power supply

(2) interchangeable radio set drawer assembly

(3) "plug-in" control head

a. Transistorized Power Supply

The new MOTOROLA fully transistorized power supply uses long-life power transistors in place of conventional vibrator units. The transistorized supply provides operating voltages for both transmitter and receiver. The use of transistors eliminates the cost of replacing vibrators and improves overall operation of the radio set.

b. Interchangeability

The radio set housing mounts either under the vehicle dash or in the trunk of the car. The same drawer assembly, including transmitter, receiver and power supply, slides into the housing in either type of installation. In mobile radio fleets where both front- and rear-mount installations are used, this design provides full flexibility of exchange between vehicles. Rear mount radio sets are remotely controlled by means of a dash-mounted control head. The drawer assemblies can be interchanged between vehicles with positive or negative ground electrical systems.

c. Plug-In Control Head

In dash-mount installations the control head plugs into a receptacle on the front of the radio set drawer assembly. Two lockscrews secure it in place. In trunk-mount installations the control head mounts on the vehicle dash and a cable kit makes the connections between the control head and the receptacle on the front of the radio set. Thus, the same radio set drawer assembly can be easily exchanged between front and rear-mount housings.

2. GENERAL DESCRIPTION

a. T-POWER "Radio Set"

The basic radio set consists of a transmitter, receiver, power supply and housing. The transmitter, receiver and power supply are assembled together to form a drawer unit which slides into the housing. External connections are made through receptacles on the front of the housing. The radio set can be installed either under the dash (front) or in the trunk (rear) of the vehicle.

Various T-POWER models are available, providing either one or two-frequency transmitters, and with either 20 kc or 40 kc channel spacing receivers. The radio set cross reference chart, which precedes this section of the manual, shows the available models and summarizes the equipment supplied with each variation.

b. Accessory Groups

In addition to the basic radio set, an "accessory group" is required to complete the installation. The accessory group includes the control

head, cable kit, antenna, mounting hardware and other required items. Accessory groups are classified for either rear-mount or front-mount installations.

(1) Rear-Mount Accessory Groups

Rear-mount accessory groups include a control head designed for mounting on the vehicle dash and a cable kit for interconnecting the radio set and control head. Control heads are available either with or without microphones. Models supplied less microphone have a four-pin receptacle for connecting a detachable microphone or handset. Models supplied with microphone have a palm-type microphone wired-in at the factory. Rear-mount accessory groups include either a 3-ohm permanent magnet speaker or the new MOTOROLA POWER-VOICE speaker with built-in booster amplifier. This speaker provides an audio output of 15 watts from the normal radio set receiver output.

Accessory groups are listed in the accessory group cross reference chart in the front of this manual.

(2) Front-Mount Accessory Groups

Front-mount accessory groups include a plug-in control head which mounts directly on the radio set front panel. These control heads are available for use with detachable microphones or complete with factory wired-in microphones as described for rear-mount control heads. The accessory group includes either a 3-ohm PM speaker or the new MOTOROLA 15-watt POWER VOICE speaker with built-in transistorized audio amplifier.

These accessory groups are listed in the accessory group cross reference chart at the front of this manual.

3. DESCRIPTION OF RADIO SET ITEMS

The items included in the radio set are summarized on the model chart at the front of this manual. Major units, such as the receiver, transmitter and power supply are fully described in the various sections of this manual, as indicated in the table of contents. Items not covered in separate sections are described in the following paragraphs.

a. Sub-panel Kit

The TK603 Sub-panel Kit is used with the radio sets covered in this manual. This kit includes the front and rear tie-plates and the hardware required to assemble the transmitter, receiver and power supply into a single mechanical unit. This three chassis assembly then slides into the housing as a drawer unit. The power supply connector mounts on the front sub-panel of this kit, making the receptacle available for an external mating plug. A coaxial cable which interconnects the receiver r-f circuit to the antenna relay is also included with this kit.

b. Housing

The 50 watt T-POWER radio sets are housed in the K-9045 Housing. This housing is 9-7/8 inches wide x 18-1/2 inches deep x 6 inches high. The housing is a heavy gauge steel cabinet designed to house the receiver, power supply and transmitter assembly as a drawer unit. The housing is finished in an automotive type baked enamel. Housing tops are removable for access to components mounted on the chassis.

c. Front Panel

The TK661 Front Panel forms the exterior front panel of the drawer unit. This panel includes an extruded aluminum heat radiator and the two power transistors used with the power supply. A chrome-plated bar on this panel is a carrying handle when pulled up and outward. Spring catches on the heat radiator fins secure the handle when not in use. A key-lock mounted on this panel secures the radio set against unauthorized personnel. Metering ports give access to the transmitter and receiver meter sockets. The 19-pin power supply receptacle is accessible through a hole in this panel. The antenna receptacle for the radio set is mounted on this panel. A coaxial cable connects this receptacle to the ANT. receptacle on the transmitter chassis.

d. Crystals

The crystals used in the radio set are listed in the radio set cross reference chart at the front of this manual. If crystals are re-ordered refer to the REPLACEMENT PARTS ORDERING paragraph in the FOREWORD of this manual.

e. Alignment Tool Kit

The K-9322 Alignment Tool Kit is included with the radio set at the rate of one kit per five sets (or less, if less than five are ordered). This kit includes the tool required for aligning the transmitter and receiver.

4. DESCRIPTION OF STANDARD ACCESSORIES

a. Cable Kits

Cable kits are not supplied as part of the radio set model, but are included in the accessory group, which must be ordered separately for each type of installation. The type of cable kit used depends upon front or rear mount installation and upon one-frequency or two-frequency operation. The cable kits available are listed in the accessory chart.

b. Installation Kit

The installation kit includes a distributor suppressor, by-pass capacitors, cable clamps and mounting hardware for installing the radio sets. It is used for front and trunk mount models.

c. Antennas

The TU304 and TU305 Series Spring Base Antennas are designed for 25-54 mc mobile radio installations. The antenna consists of a 1/4 wavelength stainless steel rod, a universal spring base swivel mount and a coaxial lead-in cable. Antenna rods are cut to length at the factory for specific frequencies. TU304 antennas have a 5-ft. lead-in; TU305 antennas have a 20-ft. lead-in. The available antennas are as follows:

Model No.	Frequency Range	Type of Installation
TU304-H	30-54 mc.	Rear Mount
TU304-L	25-30 mc.	Rear Mount
TU305-H	30-54 mc	Front Mount
TU305-L	25-30 mc.	Front Mount

d. Speaker

The TU324A Trunnion Mount Speaker is designed for mounting on a suitable flat surface in the vehicle. It can be mounted directly on the fire wall or dashboard. It can be mounted on the steering column when the TK395 Adapter Kit is used. The unit consists of a 3-ohm, 5 inch PM speaker installed in a louvered steel housing. An eight-foot, 2-conductor cable is included.

e. POWER-VOICE Speaker

The Model TU433A-12V POWER VOICE Speaker is a combination speaker and transistorized audio amplifier in a louvered steel housing. Two power transistors in a transformer-coupled, push-pull circuit boost the receiver audio output to a 15-watt level with less than 10% distortion. This unit is especially desirable for all high ambient noise applications or where the receiver must be monitored at some distance from the vehicle.

f. Control Heads

The control head provides the required control facilities for operation of the radio set. Two basic models are available for front mount radio sets and two are available for rear mount models. Model variations include one or two-frequency operation and "wired-in" microphone or provisions for detachable microphone.

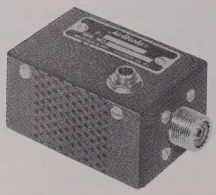
Front-mount models are designed for direct plug-in connection to the radio set front panel. Control heads for rear-mount models are mounted on the vehicle dash with an adjustable angle bracket.

Refer to the intercabling diagrams in this instruction manual for wiring details of the control heads.

OPTIONAL ACCESSORIES

TU546 SERIES PORTABLE TEST SET

For testing and alignment of Motorola transmitters and receivers. Cable and plug mate with METER sockets on radio chassis.



P-7208 WATTMETER DUMMY LOAD

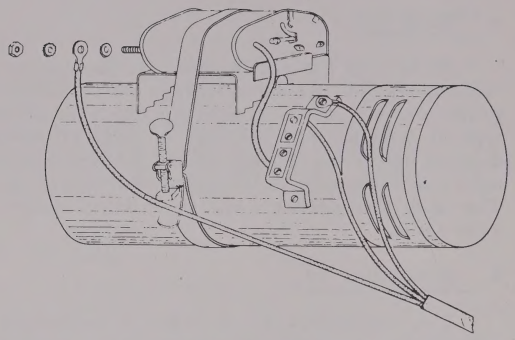
Used with portable test set to measure transmitter rf power output.

SPECIAL PURPOSE KITS

K-8292 Hood Wiper--Suppressor. Used to reduce interference from noise generated in the vehicle.

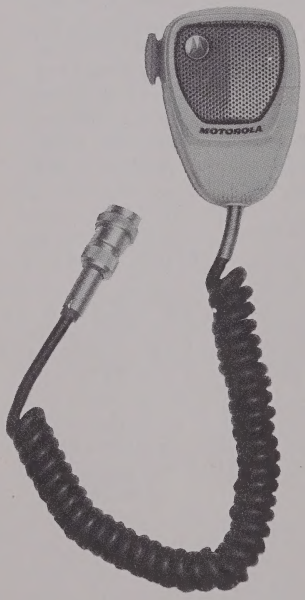
K-7257 Extension Cable. Provides full length ground return from rear-mount radio set to battery. Consists of two 17-foot lengths No. 4 cable with lugs at each end.

Long Cable Kits. For limousine and truck installations. With 20-ft cables instead of 17-ft. cables. Fully interchangeable.



P-346 GENERATOR FILTER

Used to attenuate generator interference. Rated at 40 amperes.



"PLUG-IN" UNITS
TU353A MICROPHONE
TU475 TELEPHONE HANDSET

For control heads with 4-pin MIC receptacle. Built-in transistorized pre-amplifier. Moving coil element for improved voice reproduction. 12" coiled tinsel cord. DPST push-to-talk switch. Mic. and handset interchangeable.

EPD-1491
EPD-1742 (CE1070)
MC1971
EPD-1741 (CE044)

INSTALLATION AND OPERATION

INSTALLATION

Installation instructions are packed and shipped with the radio set accessories.

OPERATION

1. PRE-OPERATIONAL CHECKS AND ADJUSTMENTS

a. Purpose

The purpose of the pre-operational check is to ascertain that the mobile radio set is operating properly when initially placed in service.

The equipment has been accurately aligned at the factory for optimum performance. It is possible, however, that mishandling in transit may have disturbed some of the adjustments. It is essential, therefore, that a pre-operational check be made to assure proper operation when the equipment is installed.

b. Pre-Installation Bench Check

The radio set can be checked before installation using a bench test set-up with permanently installed cabling and control facilities and a battery or battery eliminator. The dc supply must be a 12-volt source. An antenna dummy load, rf wattmeter or operational antenna must be connected to the radio set ANTENNA connector on the front panel. A test set for metering the transmitter and receiver should be available. This type of laboratory set-up is particularly useful where many sets must be checked, however, it does not give a complete check of the actual cables, control unit and speaker to be used.

The ideal set-up for a pre-installation check is a bench test in which the radio set, cable kit, control head, speaker and antenna are assembled to form a complete facsimile of the vehicular installation. The pictorial cabling diagrams in the installation instructions packed with the cable kit show how to interconnect the various items.

Once the test set-up is assembled the equipment can be turned on and operated as described in the following paragraphs.

c. Installation Checks

Before placing this radio set in operation make the following installation checks:

(1) General

Be sure all cable connections and bolted connections are secure. Make sure all fuses are in place and all tubes are firmly seated.

(2) DC Input

(a) Be sure the equipment is connected with the proper polarity to a 12-volt dc electrical system. Set the ON-OFF toggle switch to the ON position. This applies the dc input to the radio set.

(b) The green pilot lamp should be lit and all tube filaments should be energized. To check filaments, unlock the drawer assembly and slide the drawer out or lift the top of the housing. After making this check keep the radio set open for the following checks.

(3) Check Receiver

(a) Meter Readings

Check receiver meter readings against the STAGE MEASUREMENT CHART in the RECEIVER section (noise input readings only). Use the Motorola portable test set or equivalent 0-50 microamp. test meter. The cable of the portable test set plugs directly into the metering socket of the receiver chassis. Check meter readings in the various test positions as indicated on the chart. If any of the readings are beyond the given limits, re-align the receiver as described in the RECEIVER section.

(b) Check for Normal Operation

With the receiver properly aligned, the dc input applied to the equipment and the antenna connected, the receiver should be in full operation. Check for proper operation as follows: Turn the VOLUME control to the full clockwise position. Turn the SQUELCH control to the full counterclockwise position (open). You should hear either a loud, rushing noise in the speaker or signals from any on-frequency station which may be on the air at this time. In the absence of any received signals the loud, rushing noise is a normal indication of receiver operation with "open" squelch.

(c) To Set the VOLUME Control

There are two controls involved in adjusting the audio level to the speaker. These controls must be adjusted in the presence of a normal, fully deviated signal from the base station transmitter (or other mobile located at an average distance). To adjust these controls proceed as follows:

With a signal being received, set the VOLUME control on the control head to maximum volume (fully clockwise). Then adjust the audio level control on the receiver chassis to a setting just below the point where distortion becomes audible. Now, reset the control head VOLUME control for the desired listening level.

The use of two controls in the audio circuits permits future readjustment of the speaker level at the control head without resetting the receiver audio level control.

(d) To Set the SQUELCH Control

Turn the SQUELCH control in the clockwise direction until the noise is squelched (cuts out).

(4) FCC Regulations

The operation of the transmitter in this radio set is covered by FCC rules and regulations. Several provisions of these rules are briefly summarized in this paragraph. For complete information, refer to the current FCC regulations covering the applicable type of service and equipment. FCC regulations excerpts:

(a) Transmitter frequency and deviation must be checked before a transmitter is placed in service and at least every six months thereafter. A suitable procedure shall be employed to ascertain that the transmitter is on the assigned carrier frequency and that the transmitter crystal actually controls the frequency of the radiation. Modulation deviation is limited to ±15 kc for 40 kc, 60 kc and 120 kc channel spacing operation and to ±5 kc for 20 kc and 30 kc channels.

(b) The rf power output of a transmitter shall be no more than required for satisfactory technical operation considering the conditions of its use.

(c) Only duly authorized radio operators or personnel working directly under their supervision may tune or adjust a radio transmitter.

(5) Check Transmitter

(a) Operational Check

The transmitter must be checked for proper operation before the equipment can be placed in service. Connect a dummy load lamp, rf wattmeter or the regular mobile radio set antenna to the ANTENNA receptacle on the front panel. Set the HI-LO switch on the power supply chassis to the HI position. Press the microphone push-to-talk button momentarily and listen for relay operation. The transmit-receive relay on the power supply chassis and the antenna relay on the transmitter chassis must operate. Check for indication of rf power output. The dummy load lamp should glow or the rf wattmeter, if used, will show the rf power output. If the regular mobile antenna is used, the transmitter should radiate signals to receivers of other sets on the same frequency.

CAUTION

Do not key the transmitter more than a few seconds at a time while making these operational tests.

If the operational test is satisfactory, proceed to the next step. If there is no indication of rf output, some troubleshooting must be done before proceeding. The simplified functional diagram in this section shows the overall operation of the radio set and gives the step-by-step sequence of operations. The intercabling diagrams trace the various circuits from chassis-to-chassis. Schematic diagrams of each chassis are included in the various sections of the manual. With these diagrams, the technician can understand how the radio set works and can isolate troubles to a specific chassis or stage thereof.

(b) Meter Readings

Refer to the alignment procedure in the TRANSMITTER section of this manual. With the HI-LO switch in the HI position check meter readings against the values given in the FINAL METER READINGS CHART. The transmitter must be keyed to obtain readings. Use the microphone push-to-talk button or the switch on the Motorola portable test set. To check readings consult the chart and set the switch to a given position. Then key the transmitter just long enough to observe the reading. Readings can be taken in any order. If the readings in positions 2, 3, 4, 5 or 6 are below the minimum values given, re-align the transmitter as described in the alignment procedure. The reading in the PA position is not too important at this point, however, if it is above the maximum value given, do not key the transmitter any more than absolutely necessary.

It is advisable to follow the complete alignment procedure at this point, since the next step requires a repeak of the transmitter adjustments to obtain full rf output.

(c) Loading to Antenna

Set the HI-LO switch to LO and load the transmitter to the antenna as described in the last three steps of the alignment procedure.

d. Deviation Check

FCC regulations require a deviation check before a transmitter is placed in service. This check is described in the TRANSMITTER section.

2. OPERATOR'S INSTRUCTIONS

a. To Turn "ON" Equipment:

Place the ON-OFF switch in the ON position. The green indicator will become illuminated. The receiver is now in full operation and the transmitter filaments are "on".

NOTE

If multi-channel transmitter and/or receiver is used, place frequency selector switch in desired frequency position.

b. To Receive:

(1) Turn the VOLUME control to the full clockwise position.

(2) Turn the SQUELCH control to the full counterclockwise position.

(3) Adjust the SQUELCH control, by turning the control slowly clockwise until the noise is just squelched (cuts out). Turning the control beyond this point will increase the minimum signal necessary to open the squelch circuit.

(4) Set the control head VOLUME control to the desired speaker level with a received signal.

c. To Transmit:

(1) Remove the microphone from the hanger bracket and press the push-to-talk button. The red indicator lamp will become illuminated, indicating the transmitter is "on". If a military or noise cancelling type microphone is used, hold the microphone at approximately a 30° angle from the lips and speak clearly and distinctly across the microphone in a normal or loud voice. If a handset microphone is used, speak directly into the mouthpiece of the handset. The TRANSMITTER CANNOT BE OVER-MODULATED BY SPEAKING LOUDLY.

(2) To receive reply, release the push-to-talk button. The red indicator lamp will go "off" indicating that the transmitter circuits are no longer energized. The received reply may now be heard over the speaker and/or the handset earpiece (if used).

(3) When the transmission is completed, release the push-to-talk button and hand the microphone on the hanger bracket.

d. To Turn "OFF" the Equipment:

Place the ON-OFF switch in the OFF position. The green lamp will be turned "off".

3. CIRCUIT DESCRIPTION

The operation of the radio set as a whole is illustrated in the simplified functional diagram in this section. Refer first to the SEQUENCE OF OPERATIONS table for the various steps, then to the components as identified on the diagram. The diagram applies to both front-mount installations and rear-mount installations. The only differences between these two types of installations are in the control head and dc input circuit. The power supply, transmitter and receiver are the same for both installations.

Once the simplified diagram is clearly understood refer to the POWER SUPPLY section of this manual for full information on the transistor multivibrator and relay action. For detailed description of the transmitter and receiver, refer to the TRANSMITTER and RECEIVER sections. For exact intercabling connections between the various chassis, refer to the intercabling diagrams in this section.

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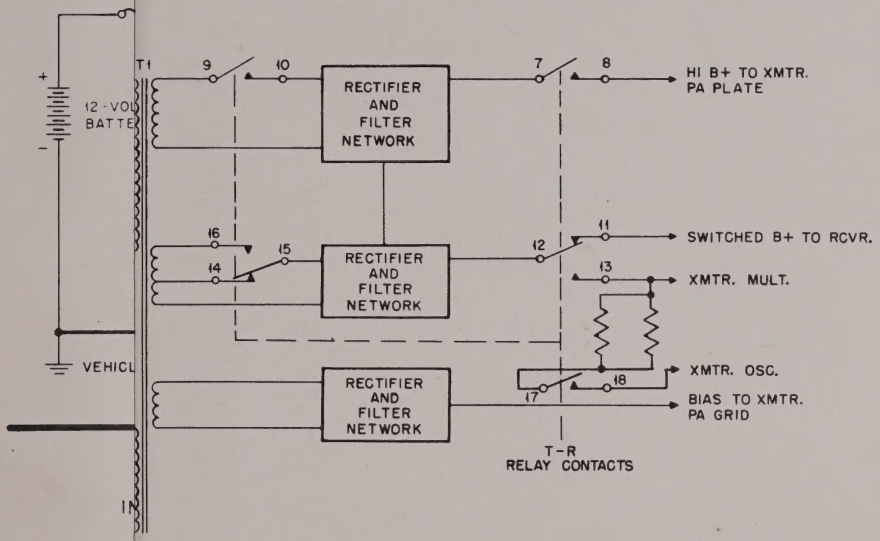

SEQUENCE OF OPERATIONS	
"TURN-ON" OPERATION	"TURN-OFF" OPERATION
1. ON-OFF SWITCH SET TO ON POSITION. 2. FRONT-MOUNT-SWITCH APPLIES DC TO RADIO SET. GREEN LAMP GOES ON. REAR-MOUNT-SWITCH ENERGIZES "A" RELAY. RELAY APPLIES DC TO RADIO SET. GREEN LAMP GOES ON. 3. FILAMENTS ENERGIZED. TRANSISTOR MULTIVIBRATOR OPERATES. RECEIVER IN FULL OPERATION ("STANDBY" CONDITION). 4. MIC. P-T-T BUTTON PRESSED. 5. TRANSMIT-RECEIVER RELAY AND ANTENNA RELAY OPERATES 6. TRANSMITTER ON AIR. RECEIVER MUTED. RED LIGHT ON ("ON-THE-AIR" CONDITION).	1. P-T-T BUTTON RELEASED. 2. TRANSMIT-RECEIVE RELAY AND ANTENNA RELAY RELEASES. 3. TRANSMITTER OFF, RECEIVER BACK IN OPERATION. RED LIGHT GOES OUT ("STANDBY" CONDITION.

Simplified Functional Diagram
Motorola No. 63E856476-A
11/5/59-RCS

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(1) Remove the microphone from the hanger bracket and press the push-to-talk button. The red indicator lamp will become illuminated, indicating the transmitter is "on". If a military or noise cancelling type microphone is used, hold the microphone at approximately a 30° angle from the lips and speak clearly and distinctly across the microphone in a normal or loud voice. If a handset microphone is used, speak directly into the mouthpiece of the handset. The TRANSMITTER CANNOT BE OVER-MODULATED BY SPEAKING LOUDLY.

(2) To receive reply, release the push-to-talk button. The red indicator lamp will go "off" indicating that the transmitter circuits are no longer energized. The received reply may now be heard over the speaker and/or the handset earpiece (if used).

(3) When the transmission is completed, release the push-to-talk button and hand the microphone on the hanger bracket.

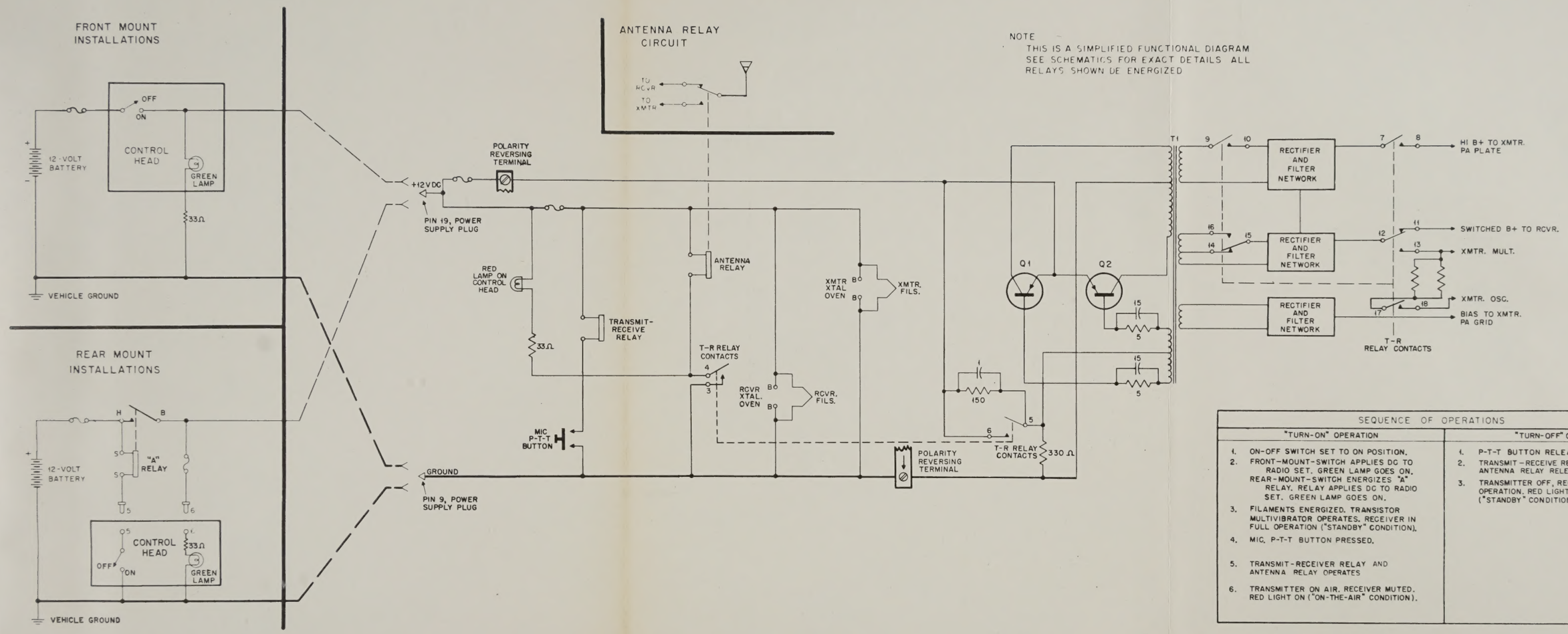
d. To Turn "OFF" the Equipment:

Place the ON-OFF switch in the OFF position. The green lamp will be turned "off".

3. CIRCUIT DESCRIPTION

The operation of the radio set as a whole is illustrated in the simplified functional diagram in this section. Refer first to the SEQUENCE OF OPERATIONS table for the various steps, then to the components as identified on the diagram. The diagram applies to both front-mount installations and rear-mount installations. The only differences between these two types of installations are in the control head and dc input circuit. The power supply, transmitter and receiver are the same for both installations.

Once the simplified diagram is clearly understood refer to the POWER SUPPLY section of this manual for full information on the transistor multivibrator and relay action. For detailed description of the transmitter and receiver, refer to the TRANSMITTER and RECEIVER sections. For exact intercabling connections between the various chassis, refer to the intercabling diagrams in this section.



NOTE
THIS IS A SIMPLIFIED FUNCTIONAL DIAGRAM
SEE SCHEMATICS FOR EXACT DETAILS ALL
RELAYS SHOWN DE ENERGIZED

SEQUENCE OF OPERATIONS

"TURN-ON" OPERATION	"TURN-OFF" OPERATION
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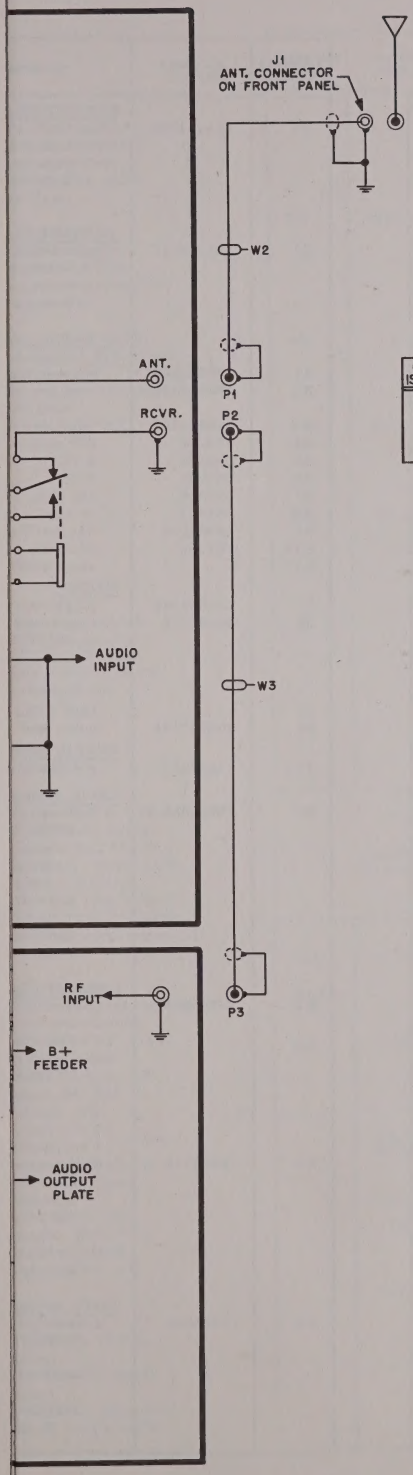
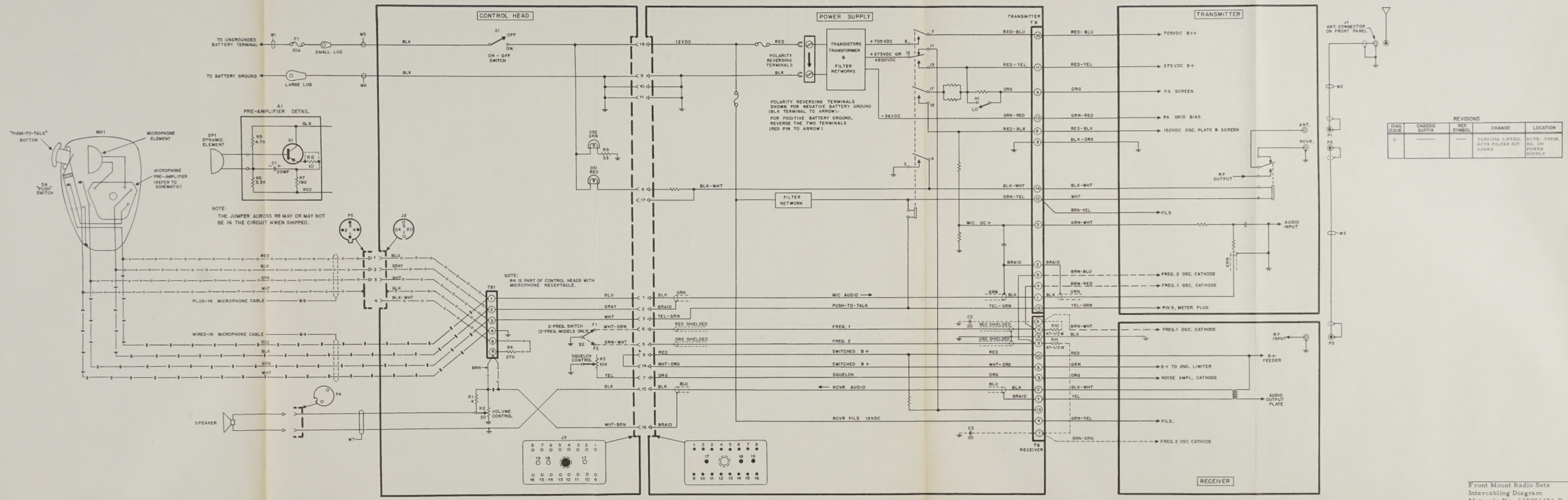
Simplified Functional Diagram
Motorola No. 63E856476-A
11/5/59-RCS



REVISIONS

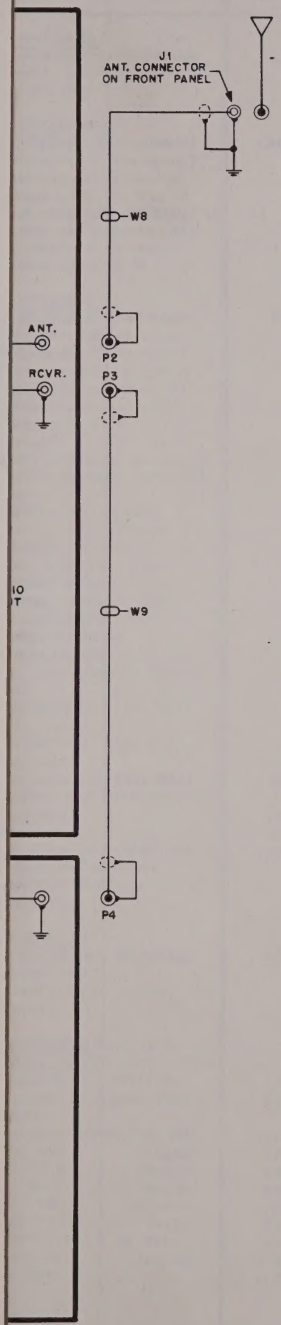
DIAG. ISSUE	CHASSIS SUFFIX	REF. SYMBOL	CHANGE	LOCATION
D	———	——	TLN6155A 2-FREQ. RCVR FILTER KIT ADDED	RCVR. TERM. BD. ON POWER SUPPLY

Front Mount Radio Sets
Intercabling Diagram
Motorola No. 63E856474-D
11/5/59-RCS



REVISIONS				
DIAG ISSUE	CHASSIS SUFFIX	REF. SYMBOL	CHANGE	LOCATION
D	———	———	TLN6155A 2-FREQ. RCVR FILTER KIT ADDED	RCVR., TERM. BD. ON POWER SUPPLY

Front Mount Radio Sets
Intercabling Diagram
Motorola No. 63E856474-D
11/5/59-RCS



REVISIONS

DIAG. ISSUE	CHASSIS SUFFIX	REF. SYMBOL	CHANGE	LOCATION
C	———	——	TLN6155A 2-FREQ. RCVR FILTER KIT ADDED	RCVR. TERM. BD. ON POWER SUPPLY

Rear Mount Radio Sets
Intercabling Diagram
Motorola No. 63E856475-C
11/5/59-RCS

PARTS LIST for Intercabling Diagram 63E856474-D

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
A1	1V861317	AMPLIFIER, AF: microphone pre-amplifier: assembly; includes 1V859594 BOARD, circuit: eyeleted assembly; includes soldering lug terminals Reference parts C1, Q1, R5, R6, R7, R8
C1	23C855013 or 23B844927	CAPACITOR, fixed: electrolytic; tubular; 20 uf +100-10%; 25 vdcw
C2 C3	23C855013	tubular; 20 uf +100-10%; 25 vdcw same as C2
DP1	59C852603	CARTRIDGE, microphone: magnetic; dynamic type; 175 ohm impedance at 1 kc
DS1 DS2	65R4151	LAMP, incandescent: 6-8 volt; .2 ampere; single contact bayonet base; globular glass; type 51 same as DS1
F1	65K52482	FUSE, cartridge: one time; paper 20 ampere; 250 volt; 2" long x 9/16" dia
J1	1V855055	CONNECTOR, receptacle: female; assembly; includes mounting bracket and single contact, coaxial connector
J2	9B16345	4 contact; polarized; round molded black phenolic base; chassis mounted, includes 4S7699 LOCKWASHER: 13/16" internal 2K81180 NUT, ring
J3	9C801050	19 contact; polarized; rectangular mld, blk, phenolic base; chassis mtd.; does not include 7B855113 BRACKET, connector mtg., nor 64C855103 PLATE, connector mtg.; bracket and plate must be ordered separately
MK1	1V854033 ("plug-in ") or 1V852400 ("wired-in")	MICROPHONE, dynamic: palm type; contains transistor amplifier and "push-to-talk" switch; includes reference parts A1, DP1, S4, W8 palm type; contains transistor amplifier and "push-to-talk" switch; includes reference parts A1, DP1, S4, W4
P1	28A474006	CONNECTOR, plug: male; single contact; round bakelite wafer insulator; cable mounted; connects to Transmitter Antenna Relay Antenna Connector
P2		same as P1 except connects to Transmitter Antenna Relay Receiver Connector
P3		same as P1 except connects to Receiver Antenna Connector
P4	9B855112	female; 2 contact; polarized; round phenolic wafer insulator; cable mounted; does not include 15B855111 SHELL, connector; shell must be ordered separately
P5	28A16370	CONNECTOR, (cont'd) male; 4 contact; polarized; round molded phenolic insulator; cable mounted; includes 41K838823 SPRING, cable strain relief
Q1	48A124317	TRANSISTOR: type MN60; does not include 14A861196 INSULATOR, transistor; insulator must be ordered separately
R1	17K892469	RESISTOR, fixed: carbon; ±10%; 1/2 w; ins.; unless otherwise stated wire-wound; 4 ohm ±2%; 1 w
R2	18K855108	variable: wire-wound; 20 ohm ±20%; 2 w
R3	18K855107	variable: wire-wound; 10K; 2 w
R4	6R6336	270 ohm; 1 w
R5	6R6080	4.7K
R6	6R5581	3.3K
R7	6R5660	180 ohm
R8	6R5621	10 ohm
R9	6R488016	33 ohm; 2 w
R10	6R5550	47 ohm
R11		same as R10
S1	40B858304	SWITCH toggle: spst
S2	40A80248	toggle: spdt; does not include 2S8382 NUT, machine: 15/32-32 x 9/16" hex; 2 required; nuts must be ordered separately
S3		NOT USED
S4	40B857174	push: dpst
TB1	31A890699	BOARD, terminal: 6 screw terminals
W1	1V832063	LEAD, electrical: Battery to Fuseholder; includes: 30K831572 CABLE, power: single conductor; #10 ga.; stranded; ins.; coded BLK; 2 ft. length required 29K832116 LUG, ring tongue: for 3/8" stud and #10 wire 29K824154 LUG, ring tongue: for #10 stud and #10 wire
W2	1V855053	LINE, RF transmission: assembly, Antenna to transmitter Antenna Relay; includes: 1V855054 ASSEMBLY, cable and plug: includes: 30B475378 CABLE, RF: coaxial; RG-58A/U; 6" length required Reference part P1 Reference part J1
W3	1K800193	Transmitter Antenna Relay to Receiver Antenna Input; includes: 30B475378 CABLE, RF: coaxial; RG-58A/U; 24" length required Reference parts P2, P3
W4	1V854006	CORD, microphone: assembly, includes: 30K852742 CORD, coiled: tinsel 41A852707 SPRING, strain relief 11M2506 TUBING, extruded, #9 BLK; 1" length req'd
W5	30K831572	CORD, microphone: (cont'd) 29A847033 LUG, terminal; wire mounted, insulation piercing; 8 req'd CABLE, power: single conductor, #10 ga. stranded ins; coded black; 9 ft. length req'd does not include 29K824154 LUG, ring tongue; for #10 wire and #10 stud; lug must be ordered separately
W6		same as W5 except does not include 29K832116 LUG, ring tongue; for #10 wire and 3/8" stud; lug must be ordered separately
W7	30A825430	2 conductor; rubber covered; each conductor; #18 ga. stranded; 41" length req'd
W8	1V854034	CORD, microphone: assembly; includes: 30K852742 CORD, coiled; tinsel 41A852707 SPRING, strain relief 11M2506 TUBING, extruded; #9 BLK; 2" length req'd 29A847033 LUG, terminal; wire mounted; insulation piercing; 4 req'd 29A847034 LUG, terminal; wire mounted; insulation piercing; 4 req'd 37K480513 SLEEVE, rubber Reference part P5

NON-REFERENCED ITEMS

The following are replaceable parts which do not appear on the intercabling diagram

XDS1 XDS2	9A859619	LAMPHOLDER: single contact; miniature; bayonet base same as XDS1
XF1	67K892616	FUSEHOLDER: single fuse mounting rectangular porcelain base; chassis mounted; for fuse 2" long x 9/16" dia.

TLN6000A Installation Kit; includes the following items:

	1V859627	Cable Clamp Kit: includes: 42A19376 CLAMP, cable: 4 req'd 3S7467 SCREW, tapping: #8 x 3/8" plain hex; 4 req'd
	1V849628	Mounting Hardware Kit: includes: 3S125947 SCREW, tapping: #14 x 3/4" plain hex: 4 req'd 4S119331 LOCKWASHER: 1/4" split; 4 req'd

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		TLN6000A Installation Kit; includes the following items:
	1V84019	Noise Filter Kit: includes: 8A821889 CAPACITOR, generator hash filter; fixed: paper tubular; .5 uf ±20%; 150 vdcw; one lead grounded; one lead insulated; 2 supplied 6A4141 SUPPRESSOR, noise: resistor; screw type 4S7670 LOCKWASHER: 1/4" internal; 2 req'd
		TK611 Cable Kit; includes reference parts F1, XF1, W1 and the following items:
	32A880952 1V474596	GASKET, fuseholder Mounting Hardware Kit, fuseholder: includes: 4A83863 WASHER, cushion: 2 supplied 3S400465 SCREW, tapping: #10 x 3/4" slotted round head; 2 supplied 4S7658 LOCKWASHER: #10 internal; 2 supplied 4S1706 WASHER: 3/8" x .203 x .033"; 2 supplied
		Control Heads Items which are common to all control heads are listed first. Items which are not common to all control heads are listed under the model number of the particular control head concerned.
		Items common to all control heads include reference parts DS1, DS2, J3, P4, R1, R2, R3, R9, S1, TB1, W5, W6, W7, XDS1, XDS2, and the following items:
	2S8382	NUT, machine: 15/32-32 x 9/16" hex; 2 req'd
	61B859620	LENS, indicator: RED
	61K859621	LENS, indicator: GRN
	4S7691	LOCKWASHER: 3/8" internal
	2S8364	NUT, machine: 3/8-32 x 1/2" hex; 2 req'd
	64C855103	PLATE, connector mounting (back cover)
	7B855113	BRACKET, connector mounting
	42A855115	CLAMP, cable
	26B857812	SHIELD, indicator lamp: 2 req'd
	3S122080	LOCKSCREW: 6-32 x 1/4" plain hex: 6 req'd
	36B855027	KNOB, control: 2 req'd
		Each control head model includes the items shown for the model, plus items listed above.

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	1V852400	TCN6000AA (1-freq. with "wired-in" microphone); includes the following items: MICROPHONE (reference part MK1)
	38A857093	BUTTON, plug
	37K106352	GROMMET, rubber; for 7/16" dia hole
	1V852400	TCN6000AB (2-freq. with "wired-in" microphone); includes reference part S2 and the following items: MICROPHONE (reference part MK1)
	38A857093	BUTTON, plug
	37K106352	GROMMET, rubber: for 7/16" dia hole
	4S7691 29R5279	TCN6000AE (1-freq. with receptacle for "plug-in" microphone); includes reference parts J2, R4 and the following items: LOCKWASHER: 3/8" internal LUG, soldering: 7/8"
	4S7691 29R5279	TCN6000AF (2-freq. with receptacle for "plug-in" microphone); includes reference parts J2, R4, S2 and the following items: LOCKWASHER: 3/8" internal LUG, soldering: 7/8"
		Microphones Items which are common to all microphones are listed first. Items which are not common to all microphones are listed under the model number of the particular microphone concerned.
		Items common to all microphones include the following parts: NOTE These items are part of reference part MK1 (both 1V854033 and 1V852400).
	1V854005	BACK HOUSING AND HANG-UP STUD ASSEMBLY
	3S124693	LOCKSCREW: 6-32 x 1/4"; Phillips round head; 3 req'd
	42A852710	STRAP, strain relief
	38A852699	BUTTON, push
	15D852566	FRONT HOUSING
	13B852703	GRILLE
	35A852701	CLOTH, grille
	32B852702	GASKET, rubber
	14A857138	INSULATOR: used for insulating printed circuit assembly
	42A852705	CLAMP, used for securing microphone cartridge
	14A857137	INSULATOR: used between clamp and microphone cartridge
	4K852762	WASHER, insulating; used as a spacer
	3S127924	LOCKSCREW: 6-32× 5/16"; Phillips round head

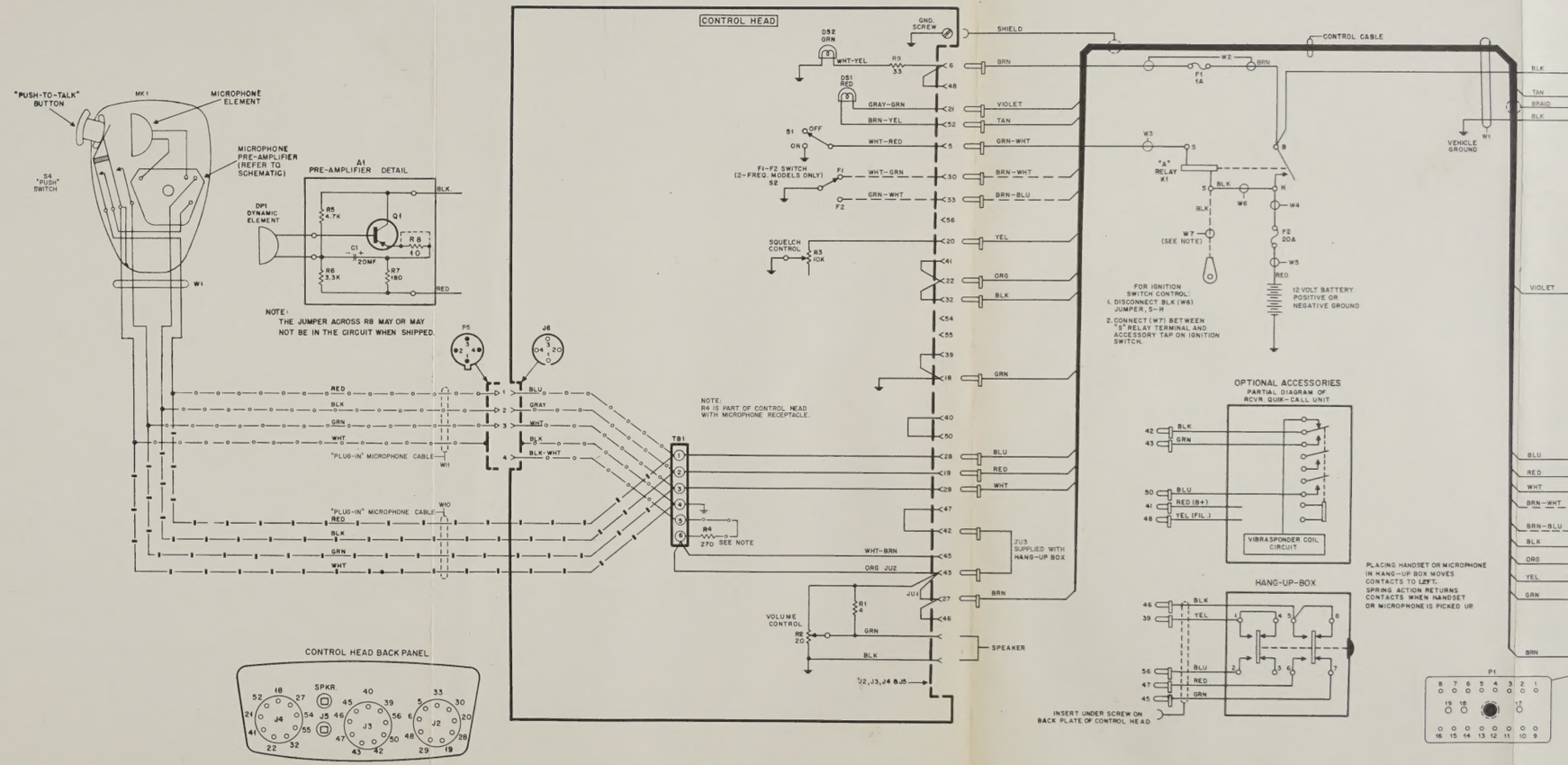
REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		NOTE These items are part of reference part MK1 (both 1V854033 and 1V852400).
	3S127481	SCREW, machine: 6-32 x 7/8"; Phillips round head; 2 required
	4S400386	LOCKWASHER: #6 split; 2 required
		Each microphone model includes the items shown for the model, plus items listed above.
		1V852400 Microphone ("wired-in" type) includes reference part MK1 (1V852400)
		TU353A Microphone ("plug-in" type) includes reference part MK1 (1V854033) and the following items:
	1V16241	Mounting Kit, microphone: includes: 64A85596 microphone hang-up 3S122830 SCREW, tapping: #8 x 1/2"; 2 req'd

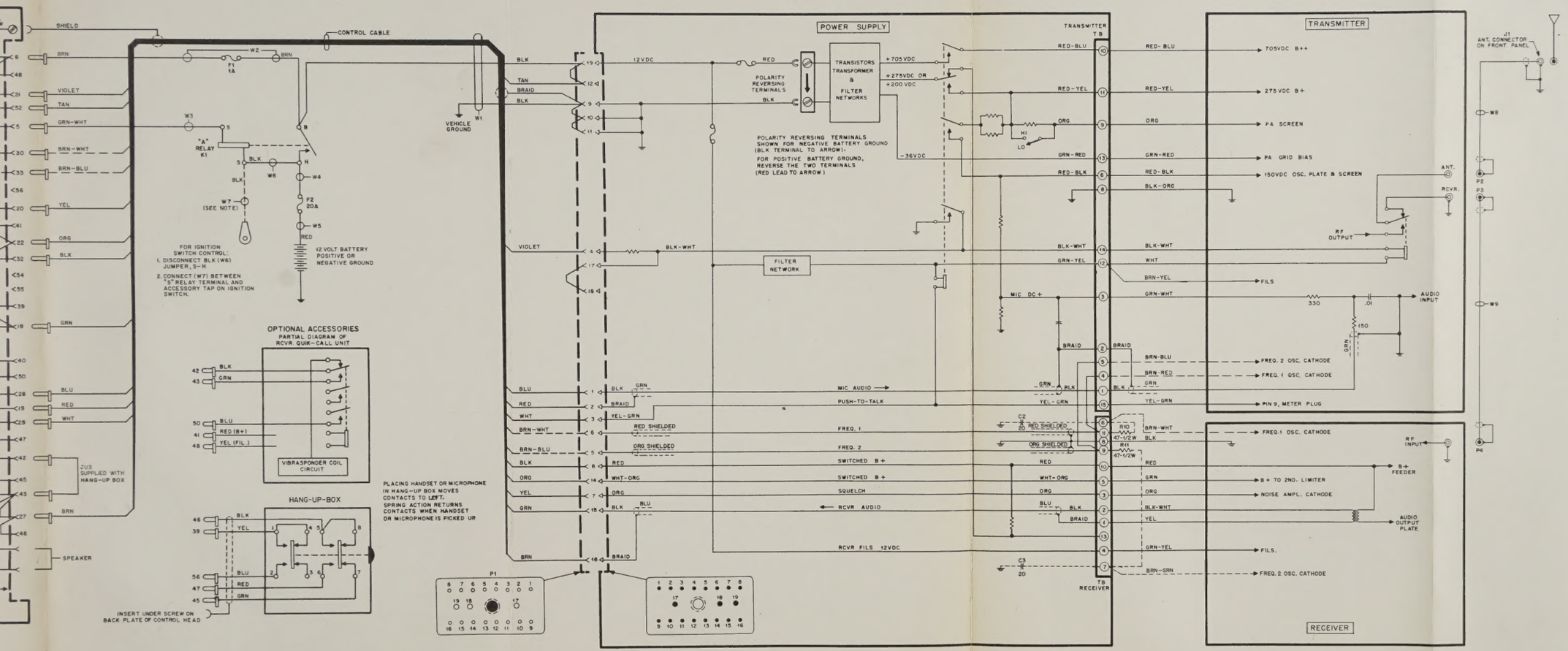
CONTROL HEAD JUMPER TABLE

CASE NO.	EQUIPMENT USED*				CIRCUIT OPERATION	JUMPERS		
	MIC.	HANDSET	HANG-UP BOX	QUIK-CALL		JU1	JU2	JU3
1	EITHER		---	---	Basic operation. Radio Set Speaker in circuit at all times	USED	USED	OMIT
2	---	X	X	---	Handset picked up connects audio to handset earpiece	OMIT	OMIT	USED
					Handset picked up connects audio to handset earpiece, speaker in circuit.	USED	OMIT	USED
3	X	---	X	X	Audio to speaker when microphone is removed or hung up. Alarm circuit energized. "Quik-call" disabled.	OMIT	USED	OMIT
4	---	X	X	X	Audio switched from speaker to handset earpiece. Alarm circuit energized	OMIT	OMIT	OMIT
					Audio switched from "quik-call" to speaker and handset. Alarm circuit energized.	OMIT	USED	OMIT
5	EITHER		---	X	"Quik-call" used for alarm purposes only. Audio to speaker at all times.	USED	USED	OMIT

EPD-1516-O

* X = item used
--- = item not used





REVISIONS

DIAG. ISSUE	CHASSIS SUFFIX	REF. SYMBOL	CHANGE	LOCATION
C	——	——	TLN6155A 2-FREQ. RCVR FILTER KIT ADDED	RCVR. TERM. BD. ON POWER SUPPLY

Rear Mount Radio Sets
Intercabling Diagram
Motorola No. 63E856475-C
11/5/59-RCS

PARTS LIST for Intercabling Diagram 63E856475-C

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
A1	1V861317	AMPLIFIER, AF: microphone pre-amplifier: assembly, includes: 1V859594 BOARD, circuit: cycleted assembly, includes: soldering lug terminals Reference parts C1, Q1, R5, R6, R7, R8
C1	23C855013	CAPACITOR, fixed: electrolytic; tubular; 20 uf +100-10%, 25 vdcw
or	23B844927	
C2	23C851013	tubular, 24 uf +100-10%, 25 vdcw
C3		same as C2
DP1	59C852603	CARTRIDGE, microphone: magnetic; dynamic type; 175 ohm impedance at 1 kc
DS1	65R4151	LAMP, incandescent: 6-8 volt; .2 ampere; single contact bayonet base; globular glass; type 51
DS2		same as DS1
F1	65R52281	FUSE, cartridge: one time; glass; 1 ampere; 250 V 1-1/4" long x 1/4" dia.
F2	65K52482	one time; paper; 20 ampere; 250 V 2" long x 9/16" dia.
J1	1V855055	CONNECTOR, receptacle: female; assembly: includes mounting bracket and single contact, coaxial connector
J2	9B855150	9 contact, polarized; round molded black phenolic insulator saddle mounted
J3		same as J2
J4		same as J2
J5	9K82810	2 contact, rectangular molded black bakelite insulator; chassis mounted
J6	9B16345	4 contact; polarized; round molded black phenolic base; chassis mounted; includes: 4S7699 LOCKWASHER: 13/16" internal 2K81180 NUT, ring
JU1		LEAD, electrical: jumper: for reference only
JU2		for reference only
JU3		for reference only
JU4		for reference only

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
K1	59K858480	RELAY, armature: 12 v dc, contact arrangement, 1 form "A"; coil resistance 76.5-93.5 ohm
MK1	1V854033 ("plug-in")	MICROPHONE, dynamic: palm type; contains transistor amplifier and "push-to-talk" switch; includes reference parts A1, DP1, S4, W11
or	1V852400 ("wired-in")	palm type; contains transistor amplifier and "push-to-talk" switch; includes reference parts A1, DP1, S4, W10
P1	9C801050	CONNECTOR, plug: female; 19 contact; polarized; rectangular; molded mica filled phenolic base; cable mounted; connects to Power Supply; does not include the following component parts which must be ordered separately: 15B800676 SHELL, connector 15B800674 COVER, connector shell 14A800673 INSULATOR, connector shell: small 14B800678 INSULATOR, connector shell: large 42A800867 CLAMP, cable 42A800669 CLAMP, cable 4A11722 WASHER, "C" 4A800671 WASHER 3B800681 SCREW, connector retaining: includes knurled knob 3S7209 SCREW, 6-32 x 1/8; 2 required 3S7362 SCREW, 6-32 x 1/2; 2 required
P2	28A474006	male; coaxial; round bakelite wafer insulator; cable mounted
P3		same as P2
P4		same as P2
P5	28A16370	male; 4 contact; polarized; includes metal shell and 41K838823 SPRING, cable strain relief
Q1	48A124317	TRANSISTOR: type MN60; does not include 14A861196 INSULATOR; insulator must be ordered separately
		RESISTOR, fixed: carbon; ±10%; 1/2 w; ins ; unless otherwise stated;
R1	17K892469	wire-wound; 4 ohm ±2%; 1 w
R2	18K855108	variable: wire-wound; 20 ohm ±20%, 2 w
R3	18K855107	variable: wire-wound; 10K; 2 w
R4	6R6736	270 ohm; 1 w
R5	6R6080	4.7K
R6	6R5581	3.3K
R7	6R5660	180 ohms
R8	6R5621	10 ohm
R9	6R488016	33 ohm; 2 w
R10	6R5550	47 ohm
R11		same as R10

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
S1	40B858304	SWITCH: toggle: spst
S2	40A80248	toggle: spdt; does not include 2S8382 NUT, machine: 15/32-32 x 9/16" hex; 2 req'd nuts must be ordered separately
S3		NOT USED
S4	40B857174	push: dpst
TB1	31A890699	BOARD, terminal: 6 screw terminals
W1	1V832061	CABLE ASSEMBLY, special purpose: includes reference part P1 and the following items: 30C830032 CABLE: 12 conductor; stranded, ins.; leads; shielded; black plastic covered; 17 ft. length req'd 29K890418 CONNECTOR, plug male; single contact; pin type; cable mounted; coded #18 also includes: the following connectors which are the same as above part number 29K890418 except for coding as indicated: Part No. — Code# 29K890419 — 19 29K890420 — 20 29K890421 — 21 29K890422 — 22 29K890427 — 27 29K890428 — 28 29K890429 — 29 29K890430 — 30 29K890432 — 32 29K890433 — 33 29K835340 — 52 also includes: 42A893468 CLAMP, cable: "wrap around" strain relief 42A893464 HOOK, "S": strain relief 29A824151 LUG, slotted tongue: for #10 stud and #10 wire 1V832062 CABLE ASSEMBLY, includes: 30K831572 CABLE, power: single conductor; stranded; insulated; coded BLK; one 17 ft. length and one 4 ft. length required 29K824154 LUG, ring tongue: for #10 stud and #10 wire 29K830073 LUG, ring tongue: for 5/16" stud and #10 wire

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
W2	1V859441	CABLE ASSEMBLY, (cont'd) assembly consisting of "in line" fuseholder with attached connecting leads: includes reference part XF1 and the following items: 29K824456 LUG, ring tongue: for #10 stud and #18 wire 29K890406 CONNECTOR, plug: male; single contact; pin type; coded #6
W3	1V859428	LEAD, electrical: includes: 10M488285 WIRE, electrical: #20 ga.; stranded, ins.; coded GRN-WHT; 68" length required 29K890405 CONNECTOR, plug: male; single contact; pin type; cable mounted; coded #5 29K824456 LUG, ring tongue: for #10 stud and #20 wire
W4	42A858471	CABLE, power: consists of a brass strap 2-3/4" long x 5/8" wide x .015" thick; processed and plated
W5	1V859446	includes: 30K813233 CABLE, power: single conductor; #10 ga.; stranded; ins.; coded RED; 5 ft. length req'd 29K830073 LUG, ring tongue for 5/16" stud 29K824154 LUG, ring tongue for #10 stud
W6	1V859442	LEAD, electrical: Relay Jumper; includes: 10M370 WIRE, electrical: single conductor; #12 ga.; stranded; ins.; coded BLK; 4" length req'd 29K845081 LUG, slotted tongue for #10 stud and #12 wire; 2 req'd
W7	1V847414	Ignition Switch Control; includes 10M430 WIRE, electrical: single conductor; #20 ga. str., ins.; coded BLK; 6 ft. length req'd 29K824456 LUG, ring tongue: for #10 stud and #20 wire; 2 req'd
W8	1V855053	LINE, RF, transmission: includes: 1V855054 LINE, RF transmission; includes: 30B475378 CABLE, RF: coaxial; RG-58A/U; 6" length req'd Reference part P2 Reference part J1
W9	1K800193	includes: 30B475378 CABLE, RF: coaxial RG-58A/U; 2 ft. length required Reference parts P3 and P4

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
W10	1V854006 ("wired-in" mic.)	CORD, microphone: includes: 30K852742 CORD, coiled; tinsel; 4 conductor 41A852707 SPRING, strain relief 11M2506 TUBING, extruded, #9 BLK; 1" length req'd 29A847033 LUG, terminal; wire mounted; insulation piercing; 8 req'd
W11	1V854034 ("plug-in" mic.)	includes: 30K852742 CORD, coiled; tinsel; 4 conductor 41A852707 SPRING, strain relief 11M9578 TUBING, extruded; #8 CLEAR; 2" length req'd 29A847033 LUG, terminal; wire mounted; insulation piercing; 4 req'd 29A847034 LUG, terminal; wire mounted; insulation piercing; 4 req'd 37K480513 SLEEVE, rubber Reference part P5

NON-REFERENCED ITEMS

The following are replaceable parts which do not appear on the intercabling diagram

XDS1	9A855117	LAMPHOLDER: single contact miniature bayonet base same as XDS1
XDS2		
XF1	9K847158	FUSEHOLDER: cable mounted; male and female retainer; single fuse mounting; includes #18 ga. wire leads, stranded, insulated, coded BRN; length 68" overall for 1-1/4" long x 1/4" dia fuse; includes reference part F1
XF2	1V859445	includes reference parts K1, W4, W5, W6, and the following items: 14B858470 BOARD, mounting; molded phenolic 42A858474 RETAINER, fuse: (top) 42A861384 RETAINER, fuse: (bottom, closed end) 15C861390 COVER, mounting board

TKN6006A Cable Kit:

includes reference parts F2, K1, W1 to W7, and the following items:

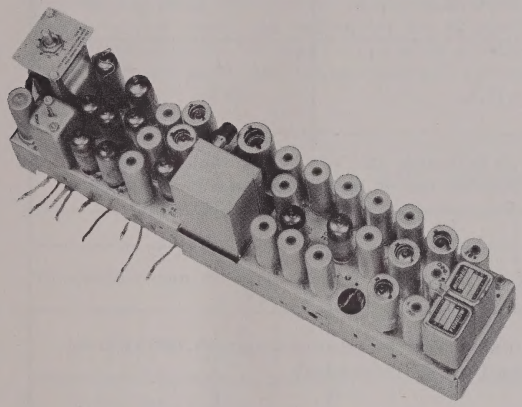
	1V859447	INSTALLATION KIT: includes: 3S8153 SCREW, tapping: #8 x 3/4" plain hex head; 3 required 3S7542 SCREW, tapping: #8 x 3/8" slotted binder head; 4 req'd 42A19376 CLAMP, cable: 4 req'd 37K107234 GROMMET, rubber

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		Control Heads Items which are common to all control heads are listed first. Items which are not common to all control heads are listed under the model number of the particular control head concerned.
		Items common to all control heads include reference parts DS1, DS2, J2, J3, J4, J5, R1, R2, R3, R9, S1, TB1, XDS1, XDS2, and the following items:
	2S8382	NUT, machine: 15/32-32 x 9/16" hex; 2 req'd
	61B859620	LENS, indicator: RED
	61K859621	LENS, indicator: GRN
	4S7691	LOCKWASHER: 3/8" internal
	2S8364	NUT, machine: 3/8-32 x 1/2" hex; 2 req'd
	64A857162	PLATE, connector mounting (back cover)
	3S122518	LOCKSCREW: 4-40 x 3/16" plain hex head; 2 req'd
	3S124542	LOCKSCREW: 6-32 x 3/4" plain hex head; 4 req'd
	36B855027	KNOB, control; 2 req'd
	7B855239	BRACKET, control head mounting
	1V859999	MOUNTING HARDWARE KIT: includes: 4K847649 WASHER, fiber: 2 req'd 4S7670 LOCKWASHER: 1/4" internal; 2 req'd 3S129304 SCREW, machine: 1/4-20 x 1/2" slotted oven head; 2 req'd
		Each control head model includes the items shown for the model, plus items listed above.
	1V852400	TCN6001AA (1-freq. with "wired-in" microphone): includes the following items: MICROPHONE (reference part MK1)
	38A857093	BUTTON, plug
	37K106352	GROMMET, rubber; for 7/16" dia hole
	1V852400	TCN6001AB (2-freq. with "wired-in" microphone); includes reference part S2 and the following items: MICROPHONE (reference part MK1)
	38A857093	BUTTON, plug
	37K106352	GROMMET, rubber; for 7/16" dia hole
	4S7691 29R5279	TCN6001AE (1-freq. with receptacle for "plug-in" microphone); includes reference parts J6, R4 and the following items: LOCKWASHER: 3/8" internal LUG, soldering: 7/8"

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	4S7691 29R5279	TCN6001AF (2-freq. with receptacle for "plug-in" microphone); includes reference parts J6, R4, S2 and the following items: LOCKWASHER: 3/8" internal LUG, soldering: 7/8"
		Microphones Items which are common to all microphones are listed first. Items which are not common to all microphones are listed under the model number of the particular microphone concerned.
		Items common to all microphones include the following parts: NOTE These items are part of reference part MK1 (both 1V854033 and 1V852400).
	1V854005	BACK HOUSING AND HANG-UP STUD ASSEMBLY
	3S124693	LOCKSCREW: 6-32 x 1/4", Phillips round head; 3 req'd
	42A852710	STRAP, strain relief
	38A852699	BUTTON, push
	15D852566	FRONT HOUSING
	13B852703	GRILLE
	35A852701	CLOTH, grille
	32B852702	GASKET, rubber
	14A857138	INSULATOR: used for insulating printed circuit assembly
	42A852705	CLAMP, used for securing microphone cartridge
	14A857137	INSULATOR: used between clamp and microphone cartridge
	4K852762	WASHER, insulating; used as a spacer
	3S127924	LOCKSCREW: 6-32 x 5/16"; Phillips round head
	3S127481	SCREW, machine: 6-32 x 7/8"; Phillips round head; 2 req'd
	4S400386	LOCKWASHER: #6 split; 2 req'd
		Each microphone model includes the items shown for the model, plus items listed above
		1V852400 Microphone ("wired in" type) includes reference part MK1 (1V852400)
		TU353A Microphone ("plug-in" type) includes reference part MK1 (1V854033) and the following items:
1V16241		Mounting Kit, microphone: includes: 64A855596 BRACKET, microphone hang-up 3S122830 SCREW, tapping: #8 x 1/2"; 2 req'd.

RECEIVER

CE055



TA235W-R2 RECEIVER

MODEL CHART

MODEL NUMBER	NUMBER OF FREQUENCIES	CHANNEL SPACING
TRB1080AA/ TA235W	1	40 KC
TRB1080AC/ TA235W-R2	2	40 KC
TRB1080AB/ TA235S	1	20 KC
TRB1080AD/ TA235S-R2	2	20 KC
TA235X	1	120 KC
TA235X-R2	2	120 KC

1. DESCRIPTION

a. Application

The receivers listed in the model chart are designed to receive FM signals on one (or two) fixed, crystal-controlled frequencies in the 25-54 mc band. The receivers obtain operating voltages from the power supply which is part of the overall radio set.

b. Design

The receiver incorporates a double-conversion superheterodyne circuit. The chassis has 15 tubes and 17 tuned circuits, excluding the plastic-sealed circuits of the PERMAKAY IF filter. The IF wave filter is the major factor in determining the signal reception bandwidth. On models designed for 20 kc channel spacing operation the signals are attenuated -100 db at ±15 kc. On 40 kc models the signals are attenuated -100 db at ±32 kc. On 120 kc models the attenuation is -100 db at ±120 kc.

c. Basic Receiver Circuitry

The basic receiver circuit consists of the following stages: an RF amplifier, a first local oscillator, a first mixer, a first IF amplifier, a second local oscillator, a second mixer, three second IF amplifiers, two limiters, a discriminator and two stages of audio amplification.

d. Two-Frequency Models

The two-frequency receiver is the same as the single-frequency receiver except for the addition of another first oscillator and control crystal. Two-frequency models receive signals on two specific, crystal-controlled frequencies in the band. Only one frequency

GUARANTEED PERFORMANCE SPECIFICATIONS

MODEL NUMBER	TRB1080AB/TA235S, TRB1080AD/TA235S-R2	TRB1080AA/TA235W, TRB1080AC/TA235W-R2	TA235X, TA235X-R2
CHANNEL SPACING	20 kc	40 kc	120 kc
SELECTIVITY	-100 db at ±15 kc	-100 db at ±32 kc	-100 db at ±120 kc
MODULATION ACCEPTANCE	±5 kc	±15 kc	±15 kc
TUNED CIRCUITS	29 including 12 plastic-sealed in Permakay filter	29 including 12 plastic-sealed in Permakay filter	20 including 3 plastic-sealed in Tri-K filter
SENSITIVITY	Less than 0.30 microvolt for 20 db quieting; 50 ohms rf input impedance		
FREQUENCY STABILITY AND TEMPERATURE RANGE	Oven type crystal maintains oscillator stability within ±0.0005% from -30° C. to +60° C. ambient (+25 C. reference)		
SPURIOUS AND IMAGE REJECTION	More than 100 db		
SQUELCH	Noise compensated type, adjustable sensitivity, threshold sensitivity of 0.10 microvolt		
TUBE COMPLEMENT AND FUNCTION	6AK5 - RF amp. *6CB6 - oscillator 6AB4 - 1st mixer 6BH6 - 1st IF amp. 6679/12AT7 - 2nd osc.-mixer *two for 2-frequency models	6CB6 - 2nd IF amp.(1) 6CB6 - 2nd IF amp.(2) 6CB6 - 2nd IF amp.(3) 6BH6 - 1st limiter 6BJ6 - 2nd limiter	6AL5 - discriminator 6BH6 - noise amp. 6C4 - noise rect. 6679/12AT7- audio and squelch amp. 6AQ5 - audio output
AUDIO OUTPUT	2 watts to a 3 ohm speaker at less than 10% distortion		
AUDIO RESPONSE	From +1 db to -8 db of 6 db/octave de-emphasis characteristic from 300-3000 cps		

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

can be received at a time. The two-frequency receivers are designed for operation with a frequency separation between channels as great as 120 kc. without any change in performance specifications. An external switch is used to select frequencies. The switch is connected into the cathode circuits of the two first local oscillator stages. In the F1 position the switch grounds the cathode of the #1 oscillator, permitting that stage to operate normally. At the same time it opens the cathode of the #2 oscillator to disable the #2 stage. In the F2 position the switch reverses the connections and selects the #2 local oscillator. The F1-F2 switch is part of the control head in mobile radio sets.

e. Chassis Complement

Each receiver consists of a basic chassis and a number of other items depending upon the frequency range, number of operating frequencies and channel spacing operation. The receivers are factory assembled from the subassemblies to form a compact single unit. The items included in each receiver are summarized in the following chart.

MODEL NUMBER	FREQ.		BASIC CHASSIS				*COIL KIT		FILTER			**CRYSTAL(S) REQUIRED	
	1-FREQ.	2-FREQ.	TU553	TU553-R2	TU553S	TU553S-R2	TK117C	TK117C-R2	TU540W	TU540S	TU540X	G04 (IF)	RM/RP-14A or RM/RP-15A (CONTROL)
TRB1080AA/ TA235W	X		X				X		X			1	1
TRB1080AC/ TA235W-R2		X		X				X	X			1	2
TRB1080AB/ TA235S	X				X		X			X		1	1
TRB1080AD/ TA235S-R2		X				X		X		X		1	2
TA235X	X		X				X				X	1	1
TA235X-R2		X		X				X			X	1	2

X = 1 used

2 = 2 used

* Coil kit designations include an L, M, H or HH suffix to indicate frequency range:

L = 25-30 mc, M = 30-40 mc, H = 40-50 mc, HH = 50-54 mc

** The crystal used with the radio set depends upon the operating frequency:

RM/RP-14A is for 25-40 mc

RM/RP-15A is for 40-54 mc

2. OPERATION

a. Stage Analysis

This receiver operates in accordance with basic FM receiver operation theory. The stage analysis given in these instructions is but a brief summary of the salient points. To follow the discussion refer to the block diagram included in this section of the manual. This diagram shows stage-by-stage signal flow and operating frequencies.

b. RF Amplifier

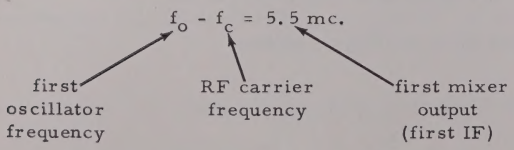
The carrier signals received at the antenna are coupled to the grid of the RF amplifier by the impedance-matching network in the input circuit. The RF stage provides some amplification of the signals, however, its main purpose in the circuit is to improve sensitivity and selectivity. The gain of this stage is designed to provide the otpimum signal-to-noise ratio in the signals sent to the first mixer. In the output of this stage three hi-Q, critically coupled tuned circuits provide very high selectivity in the signals which pass on to the mixer.

c. First Oscillator and Mixer

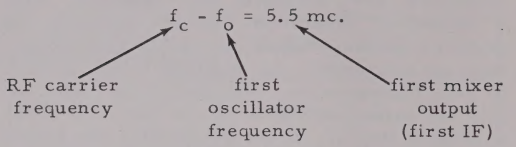
The first oscillator generates a signal of the correct frequency for direct injection into the mixer without multiplication. This frequency is heterodyned with the incoming rf carrier in the first mixer stage. The difference between these two frequencies is used as the mixer output. This output is a 5.5 mc. signal which carries the modulation originally impressed on the incoming rf carrier.

The local oscillator frequency is above the rf carrier in sets tuned to the 25-40 mc. range. The local oscillator is below the RF carrier when the receiver operates in the 40-54 mc. range. These frequency relationships can be expressed as follows:

For the 25-40 mc. range:



For the 40-54 mc. range:



In these formulas the carrier frequency is the frequency assigned to the transmitter which this receiver is intended to receive. The first oscillator operates at a specific frequency in the 30.5 to 48.5 mc. range, depending upon the rf carrier frequency. When the assigned carrier frequency is known, the oscillator frequency can be calculated as follows:

For the 25-40 mc. range:

$$f_o = f_c + 5.5 \text{ mc.}$$

For the 40-54 mc. range:

$$f_o = f_c - 5.5 \text{ mc.}$$

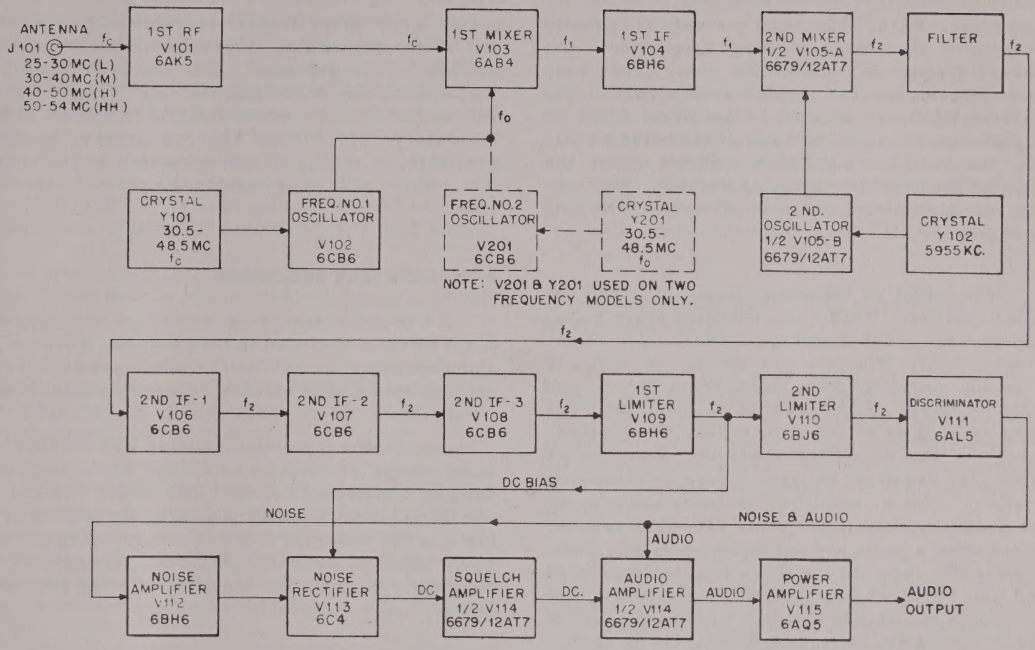
The first oscillator frequency is crystal-controlled to maintain oscillator stability within $\pm 0.0005\%$ from $-30^{\circ}C$ to $+60^{\circ}C$ ambient ($25^{\circ}C$ reference). The crystal element is mounted in a thermostatically-controlled heating oven to maintain proper operating temperature.

The first oscillator frequency is mixed with the carrier to provide the first IF, 5.5 mc., which is passed on to the first IF amplifier stage.

d. First IF and Second Mixer

The signals are amplified in the first IF amplifier and applied to the second mixer along with an injection frequency generated in the second local oscillator. The second local oscillator frequency is controlled by the IF crystal. This frequency is 5955 kc., the same for all receivers regardless of rf carrier frequency. The difference between the second local oscillator frequency and the first IF is the second mixer output. This output is a 455 kc. signal which carries the audio modulation. The frequency relationships of these three stages are as follows:

Second local oscillator freq.	5955 kc.
First intermediate freq.	5500 kc.
Difference freq. (second IF)	455 kc.



LEGEND:

f_c = CARRIER FREQUENCY (SEE TABLE)

f_o = 1ST OSCILLATOR FREQUENCY (SEE TABLE)

f_1 = 1ST INTERMEDIATE FREQUENCY = 5.5 MC.

f_2 = 2ND INTERMEDIATE FREQUENCY = 455 KC.

FORMULAS

BAND	f_o	f_c
L, M	$f_c + f_1$	$f_o - f_1$
H, HH	$f_c - f_1$	$f_o + f_1$

e. Second IF

A PERMAKAY IF filter is used in the second IF before the amplification stages. This filter is permanently sealed in polyester-styrene and is unconditionally guaranteed for the life of the receiver provided the seal is unbroken and the housing is not tampered with. This filter is the major factor in determining the bandwidth of the receiver. It greatly attenuates the signal outside the pre-determined pass-band. Signals leaving the filter are amplified by three stages of second IF amplification (tubes V106, V107 and V108) and applied to the limiter stages.

f. Limiters Discriminator and Audio Stages

The two limiter stages, tubes V109 and V110, clip the tops and bottoms of the incoming signals, thereby virtually eliminating the noise which characteristically "rides" the signals in the form of amplitude modulation. These stages are largely responsible for the "quieting" effect inherent in the FM communications receiver when it picks up an on-frequency signal. The limiter output is sent to the discriminator, tube V111, which translates frequency deviations into corresponding amplitude variations, thereby detecting the audio modulation. The audio amplification stage provides two watts audio output to a three ohm load.

g. Noise-Actuated Squelch Circuit

The noise-actuated squelch circuit consists of a noise amplifier, a noise rectifier, a dc amplifier and associated circuit components, as shown on the schematic diagram. The discriminator output is applied to the input of the noise

amplifier, V112. The input r-c network greatly attenuates the low-frequency components but passes frequencies above 3000 cps. These random frequencies are applied as a signal to the grid of V112 and amplified like other types of signal inputs. In the cathode of the noise amplifier the variable SQUELCH control varies the gain of the tube by adjusting its bias. The setting of this control is covered in the following paragraph.

The output of the noise amplifier drives the noise rectifier, V113. The rectified noise signal appears as positive voltage across the load resistor, R152. This positive voltage is added to a steady negative bias taken from the second limiter stage. The resultant of these two voltages is applied to the grid of the dc amplifier tube. In the no-signal condition, i.e., noise alone, the resultant voltage is zero or somewhat positive. The dc amplifier conducts and cuts off the audio amplifier tube. This keeps the speaker silent when signals are not being received. When signals are received the noise is greatly reduced and the rectified noise output is not enough to overcome the steady negative bias on the grid of the dc amplifier. In this condition, the dc amplifier is cut off and the audio amplifier operates, passing on the received audio signals.

h. Squelch Control Setting

The SQUELCH control limits the gain of the noise amplifier tube. In practice, this control is adjusted for a "threshold" setting. This is the point where the rectified noise voltage will bias the grid of the DC amplifier so that the audio amplifier is just barely cut-off. Then, when a weak signal is received a slight reduction in noise will cut off the DC amplifier and allow the audio amplifier to conduct.

3. OPERATING ADJUSTMENTS

a. Audio Level Adjustments

The audio level control on the receiver chassis is used to set the maximum audio level available at the VOLUME control on the control unit. This permits future adjustments to compensate for variations in tube characteristics, resistor and capacitor tolerances and transmitter deviation. This control has more than adequate range of audio drive to the 3 ohm PM speaker. It should be adjusted with the VOLUME control on the control unit set at maximum volume. Then, the receiver audio level control is adjusted to a point just below the setting where distortion becomes audible. This provides a full volume range for the control head VOLUME control. If the receiver audio level control must be adjusted in a laboratory test set-up where a speaker is not available, a setting of approximately 90 per cent full volume will approximate the normal adjustment.

4. ALIGNMENT PROCEDURE

A complete receiver alignment procedure, in chart form, is included in this section. Test set-up information, using a MOTOROLA portable test set, is also included with the alignment procedure.

Any 0-50 microampere meter with an equivalent series resistance of 20,000 ohms may be used as a metering device. The meter should be connected from chassis ground to the pin receptacle of the metering socket corresponding to the stage being measured. Refer to the applicable schematic diagram for specific metering pin receptacle information.

5. PRE-OPERATIONAL NOTES

The receiver is aligned to its exact operating frequency before it is shipped from the factory. It should, however, be checked for proper operation before it is placed in service. Make the frequency check described in step 9 of the ALIGNMENT CHART in this section. Also take meter readings for the first five entries in the stage measurement chart. If the readings are beyond the allowable limits, relaign the receiver according to the ALIGNMENT CHART.

a. Laboratory Sensitivity Check

Quieting signal is that input signal necessary to reduce the output noise at speaker 20 db. Quieting measurements should be made in a well shielded location in the absence of extraneous electrical noise.

This measurement is important in that it indicates in one measurement that the unit is working normally.

The actual measurement is made by observing the noise voltage at the speaker without any carrier at the antenna. Sufficient carrier is then introduced at the antenna to reduce the output voltage to 1/10 its former value.

To measure the quieting signal accurately, a signal generator, Motorola Model T1034A Series or equivalent, and a Motorola Portable Test Set are required. Employment of a VTVM or db output meter suitable for accurate measurement or receiver audio output, is also recommended.

(1) Turn the signal generator "on" and stabilize by a "warm-up" period of 1-1/2 to 2 hours.

(2) Connect the meter plug from the Portable Test Set to the meter receptacle on the chassis.

(3) Place the REC-XMTR-O, 50 us switch in the REC position and the GRID CURRENT-METER-FIELD STRENGTH switch in the METER position on the Test Set.

(4) Connect the signal generator, adjusted to the desired carrier frequency to the antenna input connector using the coaxial lead and 6 db. pad. The exact carrier frequency will be indicated by a zero reading on the test set with the meter switch in position +4 or -4.

(5) Connect the output meter across the voice coil leads (terminals 1 and 2 on the terminal board of the power supply or adapter chassis).

NOTE

If an output meter is not available, the test set may be used to measure receiver output by placing the test set selector switch in position 8 or 11, depending upon the test set used. (Test set measurements are purely relative and will not constitute actual output level readings.)

(6) Turn the SQUELCH control fully counterclockwise (off).

(7) With no signal input to the receiver (signal generator ATTENUATOR control set for zero output) adjust the VOLUME control on the receiver chassis for 0.5 volts of noise output on the audio output meter. (Adjust for a reading of 10.0 if the test set is used for this measurement).

(8) Adjust the output level of the signal generator until the receiver audio output is decreased 20 db. (to 0.05 volts on audio output meter) from the reading in step (7). Adjust for a reading of 1.0 if the test set is used for this measurement.

b. Stage Measurement Chart

APPROX. MICROVOLT INPUT	INPUT TO	FREQ. IN MC.	METER POSITION	METER READING OR DB.
Noise	Antenna	-	1	-0.1 to -1
Noise	Antenna	-	2	-10 to -30
Noise	Antenna	-	4	0 to $\pm$1
Noise	Antenna	-	5	-12 to -16
Noise	Antenna	-	6	-12 to -40
0.30 or less	Antenna	F_c	*DB Meter	20 db. (quieting)
2.5	Antenna	F_c	1	-5
3.0 30	Pin 1 of V 101 1st RF	F_c F_c	*DB Meter 1	20 db. (quieting) -5
3 80	Pin 6 of V 103 1st Mixer	5.5 5.5	*DB Meter 1	20 db. (quieting) -5
5 300	Pin 1 of V 104 1st IF	5.5 5.5	*DB Meter 1	20 db. (quieting) -5
5000	Filter	.455	1	-5
2000	Pin 1 of V 106 2nd IF-1	.455	1	-5
150,000	Pin 1 of V 107 2nd IF-2	.455	1	-5

NOTE

A model T1034A Signal Generator was used when taking readings on V101, and V104. A Model 65B Signal Generator with a Type H-4595 output cable was used when taking all other readings except filter input reading.

*Refer to paragraph 5.a., Laboratory Sensitivity Check, when making this measurement.

	ALIGNMENT FREQUENCY	ADJUSTMENT	TU546 TEST SET SWITCH POSITION	METER READING
DETAIL A, lower left). set the ON-OFF switch to obe in its position and place	455 kc., sharp tuning	T1 bottom slug	5	Maximum
reading (selector switch in	455 kc., sharp tuning	T1 top slug	4	Zero
nal loosely so that an in- in position to keep the input	455 kc., sharp tuning	L16	2	Maximum
with the selector switch in	455 kc., broad tuning	L15	1	Maximum
test set ON-OFF switch in	455 kc., sharp tuning	L14	1	Maximum
elow the illustration. After 1 (pin 1) of V104. The signal Adjust L13 for a maximum nd when the slug is nearest ter reading (position 1 or 2).	5.5 mc., sharp tuning	L13, L12 and L11	1 or 2	Maximum
6) of V103 and adjust L10,	5.5 mc., sharp tuning	L10, L9 and L8	1 or 2	Maximum
wdriver adjustment slot is e selector switch in posi- ch in the F2 position while	Receiver crystal frequency, sharp tuning	L5 (L201)	6	Maximum
o receive. A zero meter nal setting by rotating s rotated. Set C109 for	Carrier frequency, sharp tuning	C109 (C205)	4	Zero
llow the procedure out- 3 instead of pin 7, V105.	Carrier frequency, sharp tuning	L7	1 or 2	Maximum
ely to the grid (pin 1) of	Carrier freq., sharp tuning	L4, L3 and L2	1 or 2	Maximum
, 50 ohm, attenuation	Carrier freq., sharp tuning	L1	1 or 2	Maximum
making the adjustments. signal generator or rn VOLUME control Set the selector T reduce the	Carrier frequency, slight adj.	L14	2	Reduce audible noise

b. Stage Measurement Chart

APPROX. MICROVOLT INPUT	INPUT TO	FREQ. IN MC.	METER POSITION	METER READING OR DB.
Noise	Antenna	-	1	-0.1 to -1
Noise	Antenna	-	2	-10 to -30
Noise	Antenna	-	4	0 to ±1
Noise	Antenna	-	5	-12 to -16
Noise	Antenna	-	6	-12 to -40
0.30 or less	Antenna	F_c	*DB Meter	20 db. (quieting)
2.5	Antenna	F_c	1	-5
3.0	Pin 1 of V 101	F_c	*DB Meter	20 db. (quieting)
30	1st RF	F_c	1	-5
3	Pin 6 of V 103	5.5	*DB Meter	20 db. (quieting)
80	1st Mixer	5.5	1	-5
5	Pin 1 of V 104	5.5	*DB Meter	20 db. (quieting)
300	1st IF	5.5	1	-5
5000	Filter	.455	1	-5
2000	Pin 1 of V 106 2nd IF-1	.455	1	-5
150,000	Pin 1 of V 107 2nd IF-2	.455	1	-5

NOTE

A model T1034A Signal Generator was used when taking readings on V101, and V104. A Model 65B Signal Generator with a Type H-4595 output cable was used when taking all other readings except filter input reading.

*Refer to paragraph 5.a., Laboratory Sensitivity Check, when making this measurement.

HOW TO SET UP THE P-8500 AND P-8501 SERIES TEST SETS FOR DISCRIMINATOR AND 455 KC ALIGNMENT

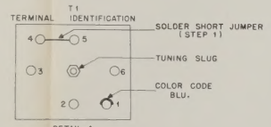
1. Set the REC.-XMTR. -050 UA switch to the REC. position.
2. Plug a 455 kc crystal into the two-pin crystal socket.
3. Set the GRID CURRENT-METER-FIELD STRENGTH selector switch to the GRID CURRENT position.
4. Set the ATTENUATOR control for maximum output (10).
5. Place the test set ON-OFF switch in the ON position. (Test set operates on internal battery. Conserve battery life by keeping switch OFF when set is not in use.)
6. Adjust the frequency control (ADJ) for a maximum meter reading.
7. Set the ON-OFF switch to the OFF position.
8. Set the GRID CURRENT-METER-FIELD STRENGTH switch to the METER position.
9. Plug the test set metering cable into the METER receptacle on the receiver chassis.
10. Connect one end of the test set extension cable to the RF OUTPUT jack on the test set. Connect the other end of the extension cable to the RF probe cable.

HOW TO SET UP THE TU546 SERIES TEST SETS FOR DISCRIMINATOR AND 455 KC ALIGNMENT

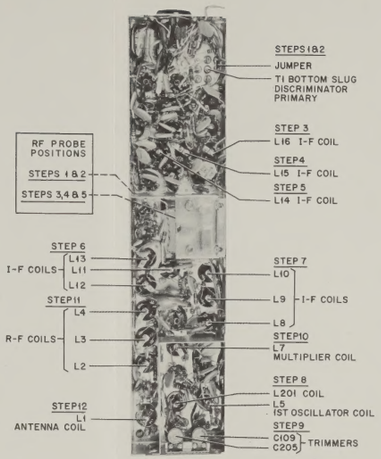
1. Set the function selector switch to the RCVR position.
2. Connect the 20-pin metering cable into the receptacle on the test set. Plug the other end (11-pin) into the metering socket on the receiver.
3. Connect one end of the test set r-f extension cable to the r-f connector on the test set. Connect the other end of the extension cable to the r-f probe cable.
4. Place the oscillator and meter reversing switch to the 455 kc position.

TEST SET SELECTOR SWITCH POSITIONS

P-8500 & P-8501 SERIES TEST SETS	1	2	+4, -4	5	6
TU546 SERIES TEST SETS	1	2	4	5	6
CIRCUIT METERED	2nd IF #3 Grid	1st Lim. Grid	Discr. Output	Discr. Input	1st Osc. Grid



DETAIL A



MC4067

HOW TO SET UP THE SIGNAL GENERATOR* FOR 5.5 MC. I.F. ALIGNMENT

1. Couple the signal generator output loosely to the grid (pin 7) of V105. Couple just enough input to give a small meter reading.
2. Set the test set selector switch to position 4. Turn on test set.
3. Set the signal generator frequency for approximately 5.5 mc.
4. Locate the exact 5.5 mc point by rotating the generator dial back and forth around the 5.5 mc setting until you obtain a meter reading of exactly zero (position 4). The meter reading should go above and below zero as the dial is rotated. Leave the generator set for zero meter reading. Make sure the signal remains constant throughout the alignment (generator may drift).

*Use Model T1034A Series or equivalent.

STEP	STAGE, TEST CONDITIONS AND PROCEDURE	ALIGNMENT FREQUENCY	ADJUSTMENT	TU546 TEST SET SWITCH POSITION	METER READING
1	**DISCRIMINATOR PRIMARY**—Solder a short jumper across terminals 4 and 5 of the discriminator secondary coil (see DETAIL A, lower left). Set up the Motorola Test Set as described in the left hand column. Place the test set selector switch in position 1 and set the ON-OFF switch to the ON position. Move the r-f probe around near pin 1, V106, until the meter reading is at least 15 ua. Secure the probe in its position and place the selector switch in position 5. Adjust T1 for maximum meter reading. Unsolder the jumper.	455 kc., sharp tuning	T1 bottom slug	5	Maximum
2	**DISCRIMINATOR SECONDARY**—With the r-f probe placed as in step 1 adjust the top slug of T1 for exactly zero meter reading (selector switch in position 4).	455 kc., sharp tuning	T1 top slug	4	Zero
3	**455 KC. I-F COIL L16**—Place the r-f probe near the input to the 455 kc i-f filter (see illustration). Couple the signal loosely so that an increase of signal strength will produce a linear increase in meter reading (switch in position 1 or 2). Secure the probe in position to keep the input at a constant level. Adjust L16 for a maximum meter reading with the switch in position 2.	455 kc., sharp tuning	L16	2	Maximum
4	**455 KC. I-F COIL L15**—Couple the signal to the i-f filter so as to obtain a maximum reading of approximately 5 ua. with the selector switch in position 1. Adjust L15 for a maximum reading.	455 kc., broad tuning	L15	1	Maximum
5	**455 KC. I-F COIL L14**—Use the same conditions as in step 4. Adjust L14 for a maximum meter reading. Place the test set ON-OFF switch in the OFF position and remove the r-f probe.	455 kc., sharp tuning	L14	1	Maximum
6	**5.5 MC I-F COILS L13, L12 and L11**—Set up the Model T1034A Series Signal Generator (or equivalent) as described below the illustration. After adjusting the signal generator set the test set selector switch to position 1 or 2 and couple the generator output to the grid (pin 1) of V104. The signal must be coupled loosely so that an increase of signal strength produces a linear increase in meter reading (position 1 or 2). Adjust L13 for a maximum meter reading with switch in position 1 or 2, note that two peaks are present within the coil tuning range. The peak found when the slug is nearest the top of the coil (as viewed from bottom of chassis) is the proper alignment peak. Adjust L12 and L11 for a maximum meter reading (position 1 or 2).	5.5 mc., sharp tuning	L13, L12 and L11	1 or 2	Maximum
7	**5.5 MC. I-F COILS L10, L9 and L8**—Follow the same procedure as in step 6 except couple the signal to the grid (pin 6) of V103 and adjust L10, L9 and L8; no double peaks will be found.	5.5 mc., sharp tuning	L10, L9 and L8	1 or 2	Maximum
8	**FIRST OSCILLATOR COIL L5**—Uncouple the signal generator. Position the ceramic trimmer, C109, so that the screwdriver adjustment slot is parallel with the length of the receiver chassis (see illustration). Adjust coil L5 for a maximum meter reading with the selector switch in position 6. If 2-frequency, set F1-F2 switch on control head to F1 position while adjusting L5. Then place the F1-F2 switch in the F2 position while adjusting trimmer C205 in the same manner as C109 above. Adjust coil L201 for a maximum meter reading.	Receiver crystal frequency, sharp tuning	L5 (L201)	6	Maximum
9	**FREQUENCY CHECK**—Transmit the carrier frequency from the transmitter which this receiver is normally intended to receive. A zero meter reading indicates that the receiver is on frequency. Adjust trimmer C109 to obtain a zero meter reading. Check the final setting by rotating C109 back and forth while observing the meter. The reading should go above and below the zero point as the trimmer is rotated. Set C109 for exactly zero meter reading. On 2-frequency receivers, adjust C205 for the number 2 frequency.	Carrier frequency, sharp tuning	C109 (C205)	4	Zero
10	**MULTIPLIER COIL L7**—The signal generator must be set for the exact carrier frequency to be received. To do this follow the procedure outlined below the illustration except select the carrier frequency instead of 5.5 mc. and couple the signal to pin 6 of V103 instead of pin 7, V105. With the generator output coupled loosely to pin 6, V103, adjust L7 for maximum meter reading (position 1 or 2).	Carrier frequency, sharp tuning	L7	1 or 2	Maximum
11	**RF COILS L4, L3 and L2**—Keep the signal generator set for the carrier frequency as in step 10. Couple the signal loosely to the grid (pin 1) of V101. Adjust L4, L3 and L2 for maximum reading (position 1 or 2).	Carrier freq., sharp tuning	L4, L3 and L2	1 or 2	Maximum
12	**ANTENNA COIL L1**—Connect the signal generator output to the antenna receptacle on the receiver chassis. Use a 6 db, 50 ohm, attenuation pad between the generator and the receiver input. Adjust L1 for maximum reading.	Carrier freq., sharp tuning	L1	1 or 2	Maximum
13	**IGNITION NOISE ADJUSTMENT**—Install the receiver in the vehicle. Start the vehicle engine and allow it to run while making the adjustments. Turn the receiver ON and allow it to warm up for five minutes. Radiate a carrier frequency signal from a transmitter, signal generator or test set (see test set instruction manual). The signal should be just strong enough to produce quieting (20 to 30 db). Turn VOLUME control on control head to normal usable level. Plug the test set metering cable into the METER receptacle on the receiver. Set the selector switch to position 2 and note the meter reading. Adjust coil L14 very slightly to reduce audible ignition noise. DO NOT reduce the meter reading more than one-half microampere.	Carrier frequency, slight adj.	L14	2	Reduce audible noise

AEPD-952-A (CE1645A)(CE056)

RE INDICATED IN OHMS, ±10%, 1/2 WATT
TED. K = 1000 OHMS.

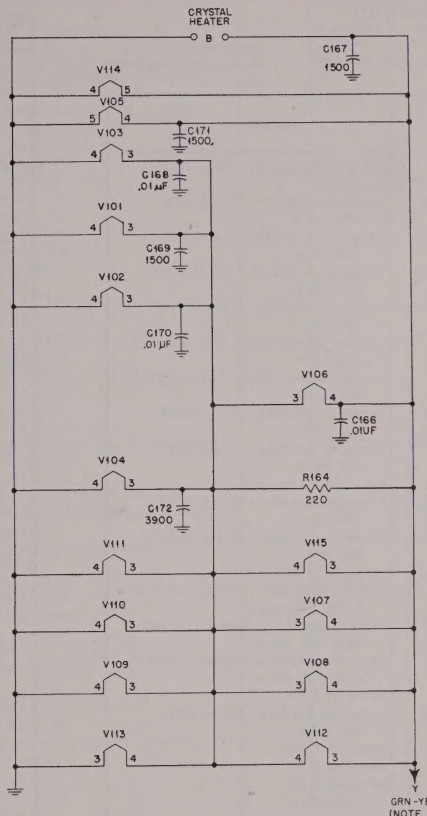
ARE INDICATED IN MICROMICROFARADS
ATED.

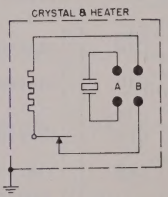
S.

) WITH A VTVM (B+ +200V) WITH SQUELCH AT
WISE) AND DC VOLUME AT MAXIMUM (CLOCKWISE).

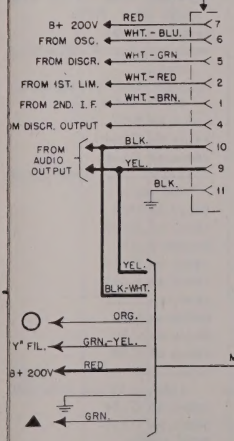
ER IN VALUE FOR THE VARIOUS RECEIVER MODELS
IS APPLICABLE.
LE FOR SPECIFIC INDENTIFICATION.

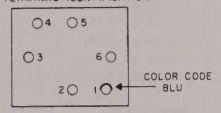
MODELS		
TA235W-L TA235W-M TA235W-H TA235W-HH	TA235X	TRB1081AB/TA235S-L TRB1082AB/TA235S-M TRB1083AB/TA235S-H TRB1084AB/TA235S-HH
OW	TU540X	TU540S
	18K	100K
	680	220
K	560K	1 MEG
	56K	180 K
	56K	180 K

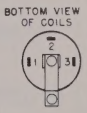




→ TO PIN 4 (METER SOCKET)

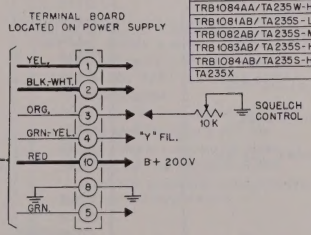




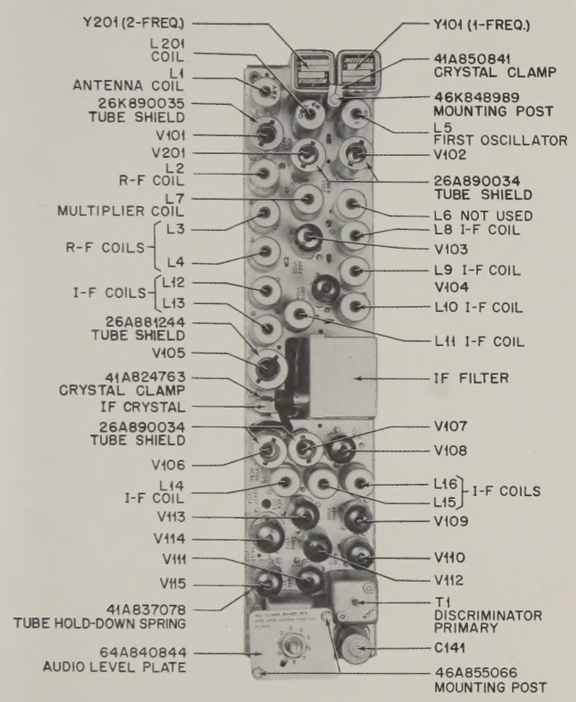


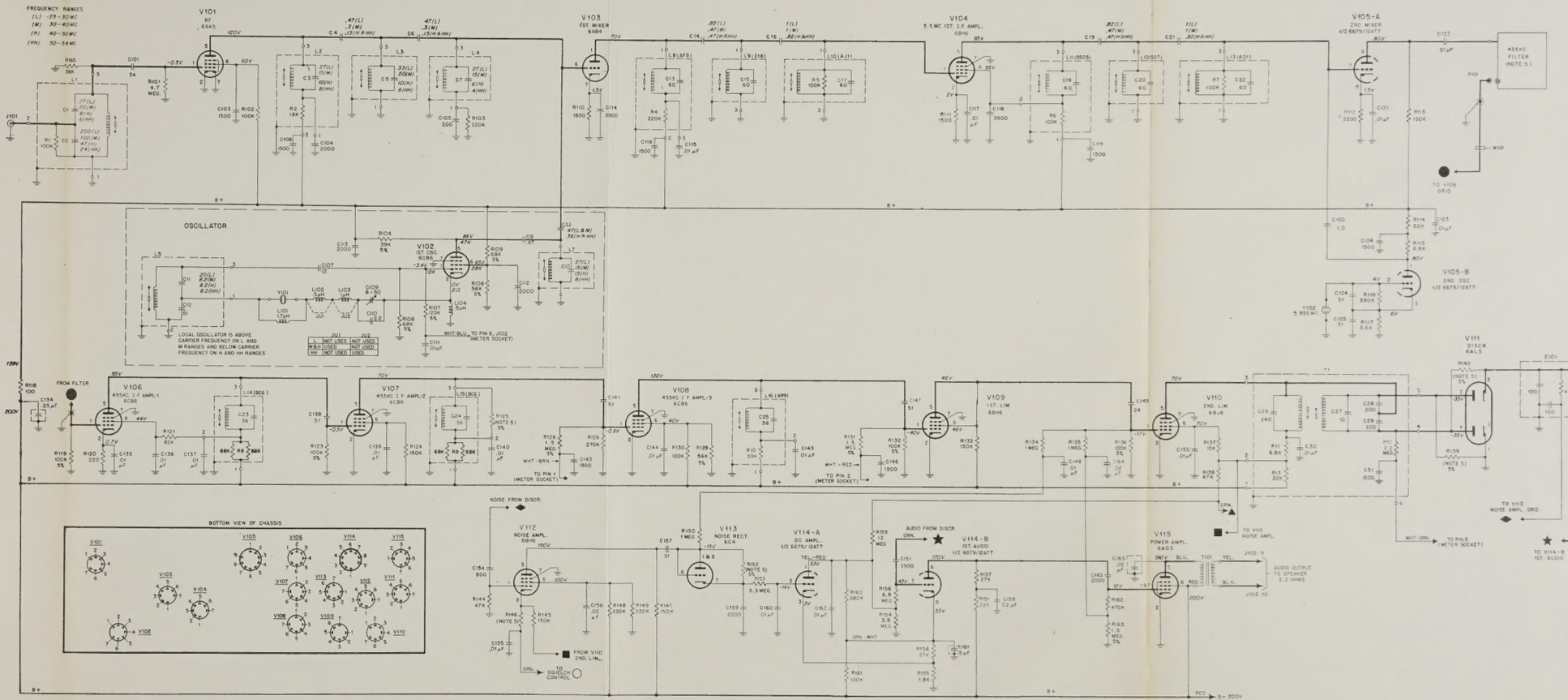
MODEL TABLE

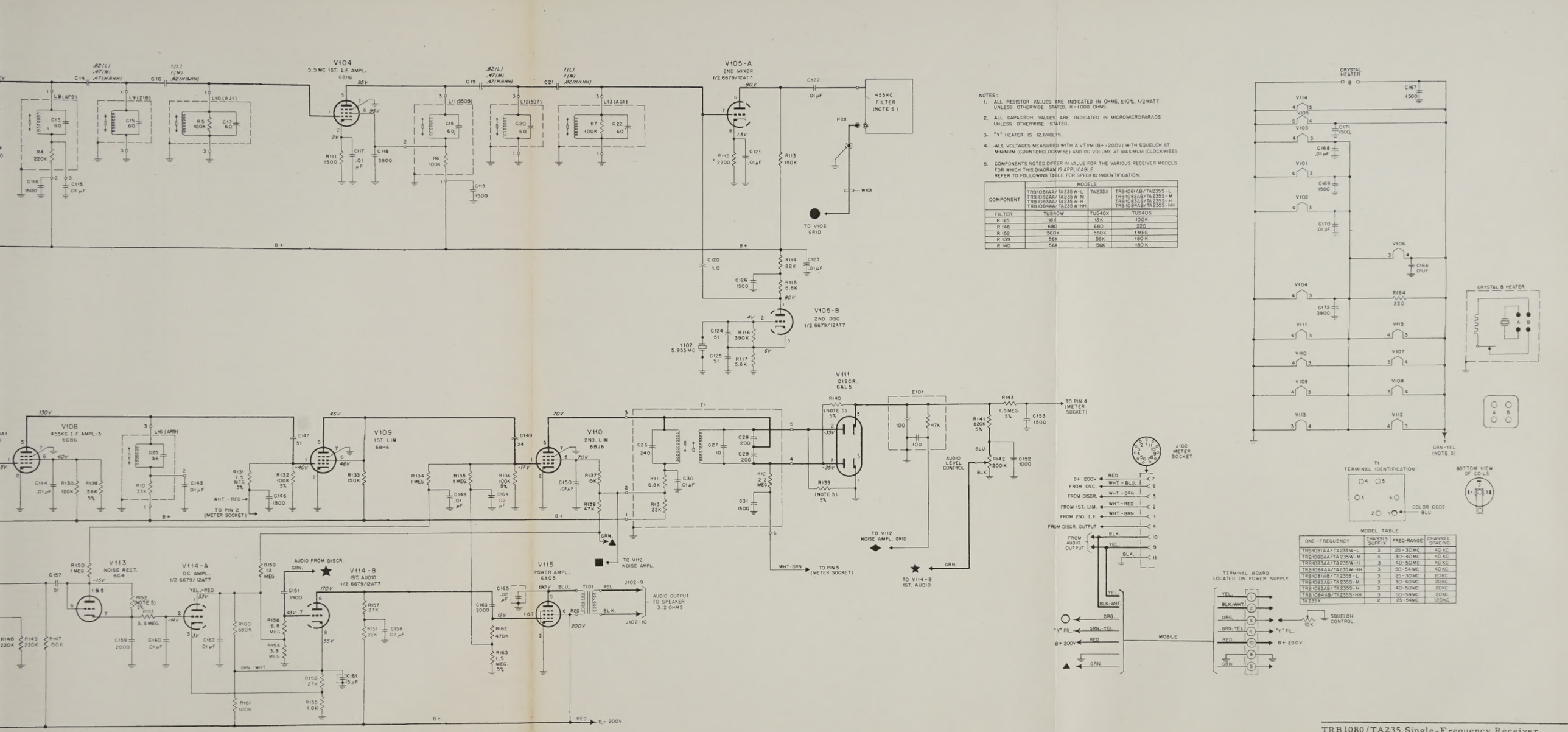
ONE-FREQUENCY	CHASSIS SUFFIX	FREQ-RANGE	CHANNEL SPACING
TRB1081AA/TA235W-L	3	25-30 MC	40 KC
TRB1082AA/TA235W-M	3	30-40 MC	40 KC
TRB1083AA/TA235W-H	3	40-50 MC	40 KC
TRB1084AA/TA235W-HH	3	50-54 MC	40 KC
TRB1081AB/TA235S-L	3	25-30 MC	20 KC
TRB1082AB/TA235S-M	3	30-40 MC	20KC
TRB1083AB/TA235S-H	3	40-50 MC	20KC
TRB1084AB/TA235S-HH	3	50-54 MC	20KC
TA235X	2	25-54MC	120 KC



TRB1080/TA235 Single-Frequency Receiver
Schematic Diagram
Motorola No. 63E854952-E
11/5/59-RCS


Y201 (2-FREQ.)
L201 COIL
L1 ANTENNA COIL
26K890035 TUBE SHIELD
V101
V201
L2 R-F COIL
L7 MULTIPLIER COIL
L3 R-F COILS
L4
L12 I-F COILS
L13
26A881244 TUBE SHIELD
V105
41A824763 CRYSTAL CLAMP
IF CRYSTAL
26A890034 TUBE SHIELD
V106
L14 I-F COIL
V113
V114
V111
V115
41A837078 TUBE HOLD-DOWN SPRING
64A840844 AUDIO LEVEL PLATE
Y101 (1-FREQ.)
41A850841 CRYSTAL CLAMP
46K848989 MOUNTING POST
L5 FIRST OSCILLATOR
V102
26A890034 TUBE SHIELD
L6 NOT USED
L8 I-F COIL
V103
L9 I-F COIL
V104
L10 I-F COIL
L11 I-F COIL
IF FILTER
V107
V108
L16
L15 I-F COILS
V109
V110
V112
T1 DISCRIMINATOR PRIMARY
C141
46A855066 MOUNTING POST


FREQUENCY RANGES
(L) 25 - 30 MC
(M) 30 - 40 MC
(H) 40 - 50 MC
(HH) 50 - 54 MC
V101 RF 6AK5
V103 1ST MIXER 6AB4
V104 5.5 MC 1ST I.F. AMPL. 6BH6
V105-A 2ND MIXER 1/2 6679/12AT7
V105-B 2ND OSC 1/2 6679/12AT7
455 KC FILTER (NOTE 5)
OSCILLATOR
V102 1ST OSC 6CB6
LOCAL OSCILLATOR IS ABOVE CARRIER FREQUENCY ON L AND M RANGES AND BELOW CARRIER FREQUENCY ON H AND HH RANGES
JU1 JU2
L NOT USED NOT USED
M & H USED NOT USED
HH NOT USED USED
WHT-BLU TO PIN 6, J102 (METER SOCKET)
V106 455 KC I.F. AMPL-1 6CB6
V107 455 KC I.F. AMPL-2 6CB6
V108 455 KC I.F. AMPL-3 6CB6
V109 1ST LIM 6BH6
V110 2ND. LIM 6BJ6
V111 DISCR 6AL5
FROM FILTER
TO PIN 1 (METER SOCKET)
TO PIN 2 (METER SOCKET)
WHT-GRN TO PIN 5 (METER SOCKET)
TO V106 GRID
TO V110 NOISE AMPL. GRID
TO V114-B 1ST. AUDIO
BOTTOM VIEW OF CHASSIS
V112 NOISE AMPL. 6BH6
V113 NOISE REGT. 6C4
V114-A DC AMPL 1/2 6679/12AT7
V114-B 1ST. AUDIO 1/2 6679/12AT7
V115 POWER AMPL. 6AQ5
NOISE FROM DISCR.
AUDIO FROM DISCR
TO V110 NOISE AMPL.
FROM V110 2ND. LIM.
TO SQUELCH CONTROL
AUDIO OUTPUT TO SPEAKER 3.2 OHMS
J102-10
J102-9
T101
YEL.
BLK.
GRN.
RED
BLU.
WHT-RED
YEL-RED
GRN-WHT
B+
B+ 200V



NOTES:

1. ALL RESISTOR VALUES ARE INDICATED IN OHMS, ±10%, 1/2 WATT UNLESS OTHERWISE STATED. K = 1000 OHMS.
2. ALL CAPACITOR VALUES ARE INDICATED IN MICROMICROFARADS UNLESS OTHERWISE STATED.
3. "Y" HEATER IS 12.6 VOLTS.
4. ALL VOLTAGES MEASURED WITH A VTVM (B+ = 200V) WITH SQUELCH AT MINIMUM (COUNTERCLOCKWISE) AND DC VOLUME AT MAXIMUM (CLOCKWISE).
5. COMPONENTS NOTED DIFFER IN VALUE FOR THE VARIOUS RECEIVER MODELS FOR WHICH THIS DIAGRAM IS APPLICABLE. REFER TO FOLLOWING TABLE FOR SPECIFIC INDENTIFICATION.

COMPONENT	MODELS		
	TRB1081AA/TA235W-L TRB1082AA/TA235W-M TRB1083AA/TA235W-H TRB1084AA/TA235W-HH	TA235X	TRB1081AB/TA2355-L TRB1082AB/TA2355-M TRB1083AB/TA2355-H TRB1084AB/TA2355-HH
FILTER	TU540W	TU540X	TU540S
R 125	18K	18K	100K
R 145	680	680	220
R 152	560K	560K	1 MEG
R 139	56K	56K	180 K
R 140	56K	56K	180 K

MODEL TABLE

ONE-FREQUENCY	CHASSIS SUFFIX	FREQ-RANGE	CHANNEL SPACING
TRB1081AA/TA235W-L	3	25-30 MC	40 KC
TRB1082AA/TA235W-M	3	30-40 MC	40 KC
TRB1083AA/TA235W-H	3	40-50 MC	40 KC
TRB1084AA/TA235W-HH	3	50-54 MC	40 KC
TRB1081AB/TA2355-L	3	25-30 MC	20 KC
TRB1082AB/TA2355-M	3	30-40 MC	20 KC
TRB1083AB/TA2355-H	3	40-50 MC	20 KC
TRB1084AB/TA2355-HH	3	50-54 MC	20 KC
TA235X	2	25-54 MC	120 KC

TRB1080/TA235 Single-Frequency Receiver
Schematic Diagram
Motorola No. 63E854952-E
11/5/59-RCS

DESCRIPTION

stal: female;
square; molded
akelite base; chassis
d
rectangular; black phen-
e; chassis mounted

AY" IF Filter;
hannel Spacing
AY" IF Filter;
hannel Spacing
AY" IF Filter;
Channel Spacing

Radio Set
receiver
ust be
stal type
quency
rdering

IT, quartz:
Control:
40 mc carrier freq;
s 6 volt heater unit

54 mc carrier freq;
s 6 volt heater unit

F; 5.955 mc

ARE INDICATED IN OHMS, ± 10%, 1/2 WATT
TED. K = 1000 OHMS.

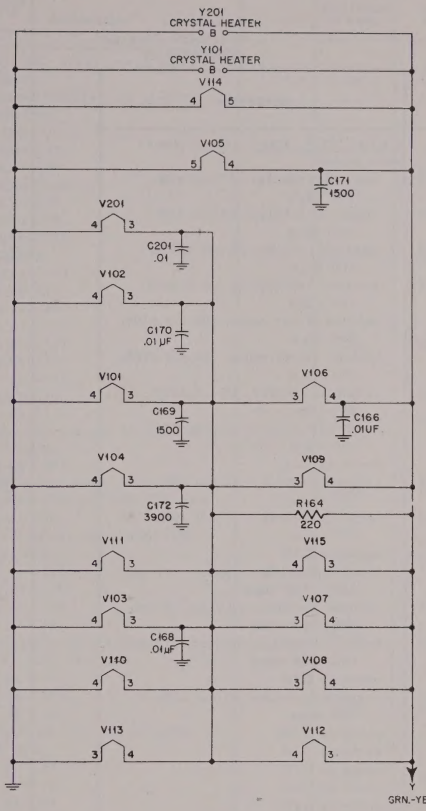
ARE INDICATED IN MICROMICROFARADS
TED.

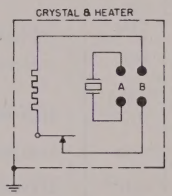
TS.

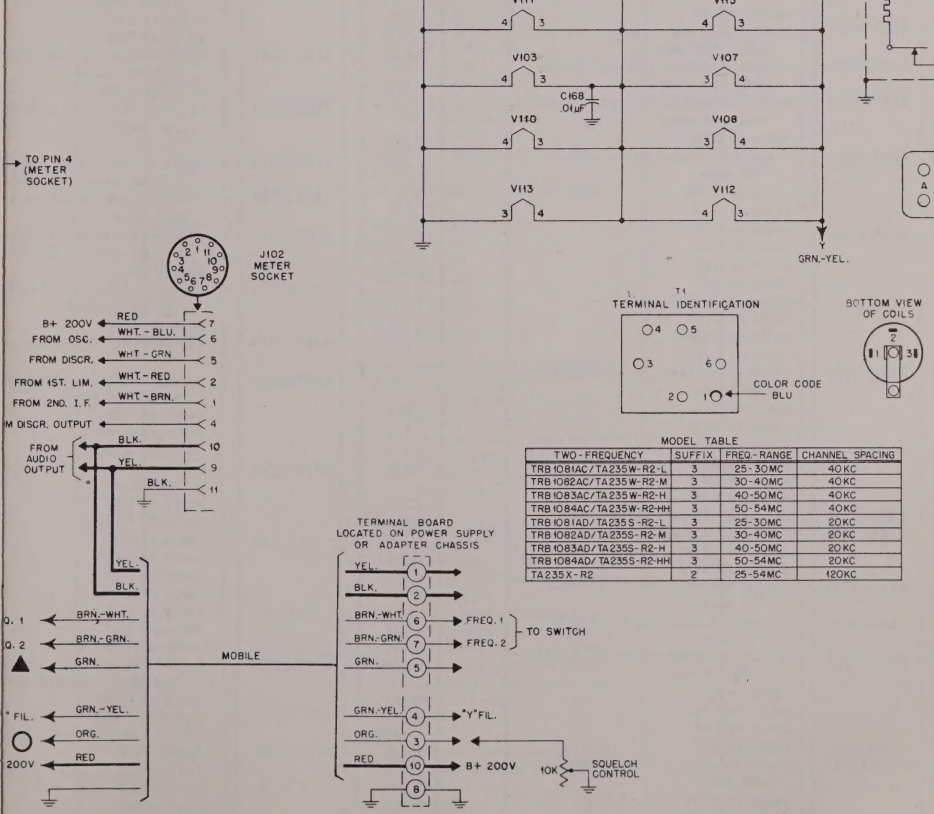
D WITH A VTVM (B+ = 200V) WITH SQUELCH AT
WISE) AND DC VOLUME AT MAXIMUM (CLOCKWISE).

ER IN VALUE FOR THE VARIOUS RECEIVER MODELS
IS APPLICABLE
LE FOR SPECIFIC INDENTIFICATION.

MODELS		
35W-R2-L 35W-R2-M 35W-R2-H 35W-R2-HH	TRB1081AD/TA235S-R2-L TRB1082AD/TA235S-R2-M TRB1083AD/TA235S-R2-H TRB1084AD/TA235S-R2-HH	TA235X-R2
	TU540S	TU540X
	100K	18K
	220	680
	1 MEG	560K
	180K	56K
	180K	56K







MODEL TABLE

TWO-FREQUENCY	SUFFIX	FREQ.-RANGE	CHANNEL SPACING
TRB1081AC/TA235W-R2-L	3	25-30MC	40KC
TRB1082AC/TA235W-R2-M	3	30-40MC	40KC
TRB1083AC/TA235W-R2-H	3	40-50MC	40KC
TRB1084AC/TA235W-R2-HH	3	50-54MC	40KC
TRB1081AD/TA235S-R2-L	3	25-30MC	20KC
TRB1082AD/TA235S-R2-M	3	30-40MC	20KC
TRB1083AD/TA235S-R2-H	3	40-50MC	20KC
TRB1084AD/TA235S-R2-HH	3	50-54MC	20KC
TA235X-R2	2	25-54MC	120KC

TRB1080/TA235 Two-Frequency Receiver
Schematic Diagram
Motorola No. 63E854953-G
11/5/59-RCS

SCHEMATIC DIAGRAM PARTS LIST

Reference:
Schematic Diagram
63E854952-E

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C1L	21R134640	ceramic; tubular; 27 uuf ±5%; 500 vdcw
C1M	21R474461	ceramic; tubular; 20 uuf ±5%; 500 vdcw
C1N	21R400073	ceramic; tubular; 8 uuf ±.5uuf; 500 vdcw
C1NH	21R400072	ceramic; tubular; 6 uuf ±.5uuf; 500 vdcw
C2L	21R2748	molded silver mica; 200 uuf ±10%; 500 vdcw
C2M	21R6631	molded silver mica; 100 uuf ±10%; 500 vdcw
C2N	21R134153	ceramic; tubular; 47 uuf ±10%; 500 vdcw
C2NH	21R31493	ceramic; tubular; 24 uuf ±5%; 500 vdcw
C3L		same as C1L
C3M	21R475262	ceramic; tubular; 15 uuf ±5%; 500 vdcw
C3N	21R490602	ceramic; tubular; 10 uuf ±5%; 500 vdcw
C3NH		same as C1N
C4L	21K83994	molded phenolic; tubular; .47 uuf ±20%; 500 vdcw
C4M	21K830201	molded phenolic; tubular; .3 uuf ±5%; 500 vdcw
C4N	21K881064	molded phenolic; tubular; .15 uuf ±5%; 500 vdcw
C4NH		same as C4N
C5L	21R120437	ceramic; tubular; 33 uuf ±5%; 500 vdcw
C5M		same as C1M
C5N		same as C3N
C5NH		same as C1N
C6L		same as C4L
C6M		same as C4M
C6N		same as C4N
C6NH		same as C4N
C7L		same as C1L
C7M		same as C3M
C7N		same as C1NH
C7NH	21R400404	ceramic; tubular; 4 uuf ± 5 uuf; 500 vdcw
C8		NOT USED
C9		same as C4L
C10L		same as C1L
C10M		same as C3M
C10N		same as C3N
C10NH		same as C1N
C11L	21K849334	cer.; disc; 20 uuf ±5%; 500 vdcw
C11M	21K847873	cer.; disc; 8.2 uuf, ± .5%, 500 vdcw
C11N		same as C11M
C11NH		same as C11M
C12	21K847711	molded silver mica; 51 uuf ±5%; 500 vdcw
C13	21R400448	ceramic; tubular; 60 uuf ±10%; 500 vdcw
C14L	21K675679	molded phenolic; tubular; .82 uuf ±10%, 500 vdcw
C14M		same as C4L
C14N		same as C4L
C14NH		same as C4L
C15		same as C1J
C16L	21C83959	molded; tubular; 1 uuf ± .2 uuf; 500 vdcw
C16M		same as C16L
C16N		same as C14L
C16NH		same as C11L

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C17		same as C13
C18		same as C13
C19L		same as C14L
C19M		same as C4L
C19N		same as C4L
C19NH		same as C4L
C20		same as C13
C21L		same as C16L
C21M		same as C16L
C21N		same as C14L
C21NH		same as C14L
C22		same as C13
C23	21R87127	ceramic; tubular; 36 uuf ±5%; 500 vdcw
C24		same as C23
C25		same as C23
C26	21K840048	molded silver mica; 240 uuf ±5%; 500 vdcw
C27	21K840811	ceramic; disc; 10 uuf ±5%; 500 vdcw
C28	21K840812	molded silver mica; 200 uuf ±5%; 500 vdcw
C29		same as C28
C30	21B801139	ceramic; disc; .01 uf +80-20%; 600 vdcw
C31	21B800801	ceramic; disc; 1500 uuf GMV +100% max.; 500 vdcw
C32L		same as C4L
C32M		same as C4L
C32N	21K842041	molded phenolic; tubular; .36 uuf ±5%; 500 vdcw
C32NH		same as C32H
C101	21K840365	ceramic; disc; 24 uuf ±5%; 500 vdcw
C102		NOT USED
C103	21B800801	ceramic; disc; 1500 uuf GMV +100%; max.; 500 vdcw
C104	21K837746	ceramic; disc; 2000 uuf ±10%; 500 vdcw
C105	21K840812	molded; silver mica, phenolic coated; 200 uuf ±5%, 500 vdcw
C106		NOT USED
C107	21K847874	ceramic; disc; 12 uuf ±5%; 500 vdcw; NPO
C108		same as C103
C109	20B840719	variable; air; 8 uuf min. to 50 uuf max.
C110	21K84247	molded phenolic; tubular; 2. 2 uuf ±10%, 500 vdcw
C111		same as C101
C112		same as C104
C113		same as C104
C114	21K837996	ceramic; disc; 3900 uuf; ±10%; 500 vdcw
C115		same as C30
C116		same as C103
C117		same as C30
C118		same as C114
C119		same as C103
C120		same as C16L
C121		same as C30
C122		same as C30
C123		same as C30
C124	21K840711	molded silver mica; phenolic coated; 51 uuf ±5%, 500 vdcw
C125		same as C124
C126		same as C103
C127		NOT USED
C128		NOT USED
C129		NOT USED
C130		NOT USED
C131		NOT USED
C132		NOT USED
C133		NOT USED

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C134	8A892986	oil filled; tubular; .25 uf ±20%, 400 vdcw
C135		same as C30
C136		same as C30
C137		same as C30
C138		same as C124
C139		same as C30
C140		same as C30
C141		same as C124
C142		NOT USED
C143		same as C103
C144		same as C30
C145		same as C30
C146		same as C103
C147		same as C124
C148		same as C30
C149		same as C101
C150		same as C30
C151		same as C114
C152	21K847601	molded silver mica; 1000 uuf ±5%, 500 vdcw
C153		same as C103
C154	21K840049	molded silver mica; phenolic coated; 800 uuf ±5%, 300 vdcw
C155		same as C30
C156	21B101029	ceramic; disc; .02 uf +80-20%; 500 vdcw
C157		same as C124
C158		same as C156
C159		same as C104
C160		same as C30
C161	23K890624	electrolytic; tubular; 5 uf +100-15%; 150 vdcw
C162		same as C30
C163		same as C103
C164		same as C156
C165	8K85984	oil filled; tubular; .02 uf ±20%, 400 vdcw
C166		same as C30
C167		same as C103
C168		same as C30
C169		same as C103
C170		same as C30
C171		same as C103
C172		same as C114
		CAPACITOR-RESISTOR ASSEMBLY:
E101	21K842354	tubular; consisting of: dual CAPACITOR, printed circuit, silver paint on ceramic form; each section 100 uuf, 300 vdcw one RESISTOR; fixed; carbon; 47K ±20%
		CONNECTOR, receptacle:
J101	9A87120	female; single contact, round molded mica filled phenolic base; for 1/8" diameter male pin connector
J102	9B86864	female; 11 contact; polarized; round molded black plastic base, chassis mounted; does not include 42AB2428 RING, connector retainer, which must be ordered separately
		COIL,
L1L	24K824723	RF; Antenna; base stamped 723; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1L, C2L, R1

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
L1M	24K824722	COIL, RF; Antenna; base stamped 722; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1M, C2M, R1
L1N	24K825514	RF; Antenna, base stamped 514; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1H, C2H, R1
L1NH	24K881365	RF; Antenna; base stamped 365; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1HH, C2HH, R1
L2L	24K831225	RF; Plate; base stamped 225; includes 46K88127 6 CORE, adjustable tuning; coded ORANGE dot and C3L, R2
L2M	24K831224	RF; Plate; base stamped 224; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C3M, R2
L2N	24B825525	RF; Plate; bas stamped 525; includes 46k-881276 CORE, adjustable tuning; coded ORANGE dot and C3H, R2
L2NH	24K831366	RF; Plate; base stamped 366; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C3HH, R2
L3L	24K831221	RF; Coupling; base stamped 221; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5L.
L3M	24K831220	RF; Coupling; base stamped 220; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5M
L3N	24K825516	RF; Coupling; base stamped 516; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5H
L3NH	24K825515	RF; Coupling; base stamped 515; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5HH
L4L	24K824726	RF; Mixer Grid; base stamped 726; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7L
L4M	24B824336	RF; Mixer Grid; base stamped 336; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7M
L4N	24K824724	RF; Mixer Grid; base stamped 724; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7H
L4NH	24K831367	RF; Mixer Grid; base stamped 367; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7HH
L5L	24B855844	RF; 1st Oscillator; base stamped BC7; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C11L, C12
L5M	24B847871	RF; 1st Oscillator; base stamped AX4; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C11, C12

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		COIL,
L5H		same as L5M exc, inc. C11H, C12
L5HH		same as L5M exc, inc. C11HH, C12
L6		NOT USED
L7L		same as L4L except Injection and includes C10L
L7M		same as L4M except Injection and includes C10H
L7H		same as L4H except Injection and includes C10HH
L7HH		same as L3HH except Injection and includes C10HH
L8	24K837228	IF; 5.5 mc IF - 1; base stamped AF7; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C13, R4
L9	24K830218	IF; 5.5 mc IF - 2; base stamped 218; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C15
L10	24K837470	IF; 5.5 mc IF - 3; base stamped AJ1; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C17, R5
L11	24B825505	IF; 5.5 mc IF - 4; base stamped 5505; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C18
L12	24B825507	IF; 5.5 mc IF - 5; base stamped 507; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C12
L13	24K837229	IF; 5.5 mc IF - 6; base stamped AG1; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C22, R7
L14	24K854048	IF; 2nd IF - 1; base stamped BG6; includes 46K891110 CORE, adjustable tuning; coded GRN dot and C23, R8
L15		same as L14 except 2nd IF - 2 and includes C24, R9
L16	24K840842	IF; 2nd IF - 3; base stamped AR9; includes 46K891110 CORE, adjustable tuning; coded ORANGE dot and C5H
L101	24K847869	RF; choke, 1.7 uh, coded BLK-GRN dot
L102	24K847870	RF; choke, .5 uh, coded BLK-VIO dot
L103	24B840042	RF; choke, 1 uh; coded RED-BLK dot
L104		same as L102
P101	28K849416	CONNECTOR, plug; male single contact; round brown bakelite wafer insulator; cable mounted
		RESISTOR, fixed: carbon, unless otherwise stated
R1	6R6031	100K ±10%, 1/2 w; ins.
R2	6R5591	18K ±10%, 1/2 w; ins.
R3		NOT USED
R4	6R6407	220K ±10%, 1/2 w; ins. same as R1
R5		same as R1
R6		same as R1
R7		same as R1
R8		effective resistance 33K, consists of: two (2) 6R6074 RESISTORS, fixed; carbon; each unit 68K ±10%, 1/2 w; ins.; parallel connected

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		RESISTOR, fixed: carbon; unless otherwise stated
R9		same as R8
R10	6R6410	33K ±10%, 1/2 w; ins.
R11	6R6428	6.8K ±10%, 1/2 w; ins.
R12	6R6433	2.2 meg ±10%, 1/2 w; ins.
R13	6R6397	22K ±10%, 1/2 w; ins.
R101	6R6446	4.7 meg ±10%, 1/2 w; ins.
R102		same as R1
R103		same as R4
R104	6R400076	39K ±5%, 1/2 w; ins.
R105		NOT USED
R106	6R6479	68K ±5%, 1/2 w; ins.
R107	6R2049	120K ±5%, 1/2 w; ins.
R108	6R601906	56K ±5%, 1/2 w; ins.
R109		same as R106
R110	6R2089	1.8K ±10%, 1/2 w; ins.
R111	6R6038	1.5K ±10%, 1/2 w; ins.
R112	6R6069	2.2K ±10%, 1/2 w; ins.
R113	6R6398	150K ±10%, 1/2 w; ins.
R114	6R5644	82K ±10%, 1/2 w; ins.
R115		same as R11
R116	6R5646	390K ±10%, 1/2 w; ins.
R117	6R6117	5.6K ±10%, 1/2 w; ins.
R118	6R6326	100 ohm ±10%, 1/2 w; ins.
R119	6R5553	100K ±5%, 1/2 w; ins.
R120	6R6270	220 ohm ±10%, 1/2 w; ins.
R121		same as R114
R122		NOT USED
R123		same as R119
R124		same as R113
R125	6R488095	18K ±5%, 1/2 w; ins.; used only in TA235W and TA235X
	or 6R5553	100K ±5%, used only in TA235S
R126	6R6414	270K ±10%, 1/2 w; ins.
R127		NOT USED
R128	6R400228	1.5 meg ±5%; 1/2 w; ins
R129		same as R108
R130	6R5631	120K ±10%, 1/2 w; ins.
R131		same as R128
R132		same as R119
R133		same as R13
R134	6R6046	1 meg ±10%, 1/2 w; ins.
R135		same as R134
R136		same as R119
R137	6R6477	15K ±10%, 1/2 w; ins.
R138	6R6048	47K ±10%, 1/2 w; ins.
R139	6R401006	56K; used only in TA235W and TA235X
	or 6R2061	180K ±5%; used only in TA235S
R140		same as R139
R141	6R5773	820K ±10%,
R142	18K845110	variable; 200K ±20%; 1/4 w
R143		same as R128
R144		same as R138
R145		same as R113
R146	6R6040	680 ohm; used only in TA235W and TA235X
	or 6R6270	220 ohm; used only in TA235S
R147		same as R113
R148		same as R4
R149		same as R4
R150		same as R134
R151		same as R13
R152	6R5796	560K ±5%, 1/2 w; ins. used only in TA235W and TA235X
	or 6R5587	1 megohm ±5%, 1/2 w; ins.; used only in TA235S
R153	6R6497	3.3 meg ±10%, 1/2 w; ins.
R154	6R490110	3.9 meg ±10%, 1/2 w; ins.
R155		same as R110
R156	6R6434	27K ±10%, 1/2 w; ins.
R157		same as R156
R158	6R2097	6.8 meg ±10%, 1/2 w; ins.
R159	6R490336	12 meg ±10%, 1/2 w; ins.
R160	6R6475	680K ±10%, 1/2 w; ins.

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R161		RESISTOR, fixed: carbon; unless otherwise stated same as R1
R162	6R6377	47K ±10%, 1/2 w; ins.
R163		same as R128
R164		same as R120
R165	6R6378	56K ±10%, 1/2 w; ins.
T1	1V842353	TRANSFORMER: RF; discrim.; coded BLU dot; inc.; two 76A821495 CORE, adjust tuning; coded YEL dot and G26, G27, G28, G29 C26, G31, R11, R12, R13
T101	25K847479	AF; output; 5000 ohm at 55 ma to 3 ohm
V101	6AK5	TUBE, electron
V102	6CB6	electron
V103	6AB4	electron
V104	6BH6	electron
V105	12AT7	electron
V106	6CB6	electron
V107		same as V106
V108		same as V106
V109		same as V104
V110	6BJ6	electron
V111	6AL5	electron
V112		same as V104
V113	6C4	electron
V114		same as V105
V115	6AQ5	electron
W101	1V857900	LINE, RF transmission: assembly includes: 30B475378 CABLE, RF; coaxial; RG-58A/U; 4" length required Reference part P101
XV101	9B834083	SOCKET, tube; female; 7 contact; miniature; molded mica filled phenolic base; saddle mounting; includes center shield and tube shield base
XV102		same as XV101
XV103	9K87124	7 contact; miniature, molded mica filled phenolic base; saddle mounting includes center shield
XV104		same as XV103
XV105	9B881243	9 contact; miniature; molded black phenolic base; saddle mounting; includes center shield and tube shield base
XV106	9K849460	9 contact; miniature, molded mica filled phenolic base; saddle mounting; includes center shield and tube shield base
XV107		same as XV106
XV108	9B87123	7 contact; miniature, molded black phenolic base; saddle mounting; includes center shield
XV109		same as XV108
XV110		same as XV108
XV111		same as XV108
XV112		same as XV108
XV113		same as XV106
XV114	9B86868	9 contact; miniature; molded black phenolic base; saddle mounting; includes center shield
XV115		same as XV108

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
XY101	9K857508	SOCKET, crystal; female; 4 contact; square; molded black bakelite base; chassis mounted
XY102	9K861367	2 contact; rectangular; black phenolic base; chassis mounted

FILTER

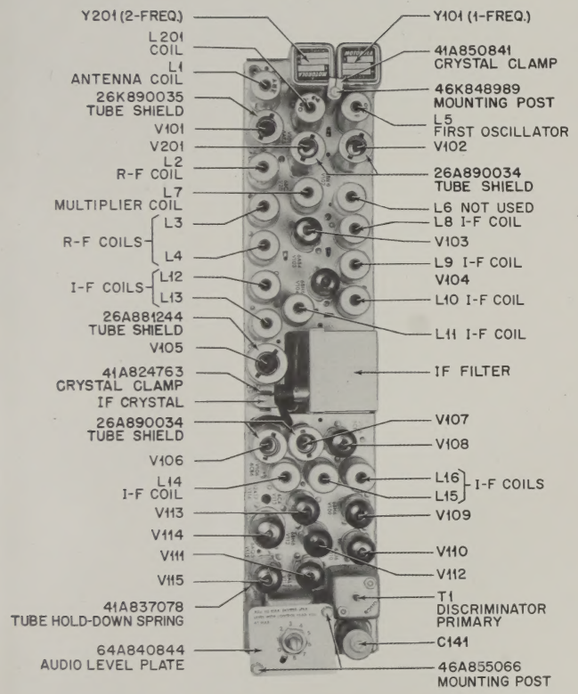
	TU540S	"PERMAKAY" IF Filter; 30 KC Channel Spacing
	TU540W	"PERMAKAY" IF Filter; 60 KC Channel Spacing
	TU540X	"PERMAKAY" IF Filter; 120 KC Channel Spacing

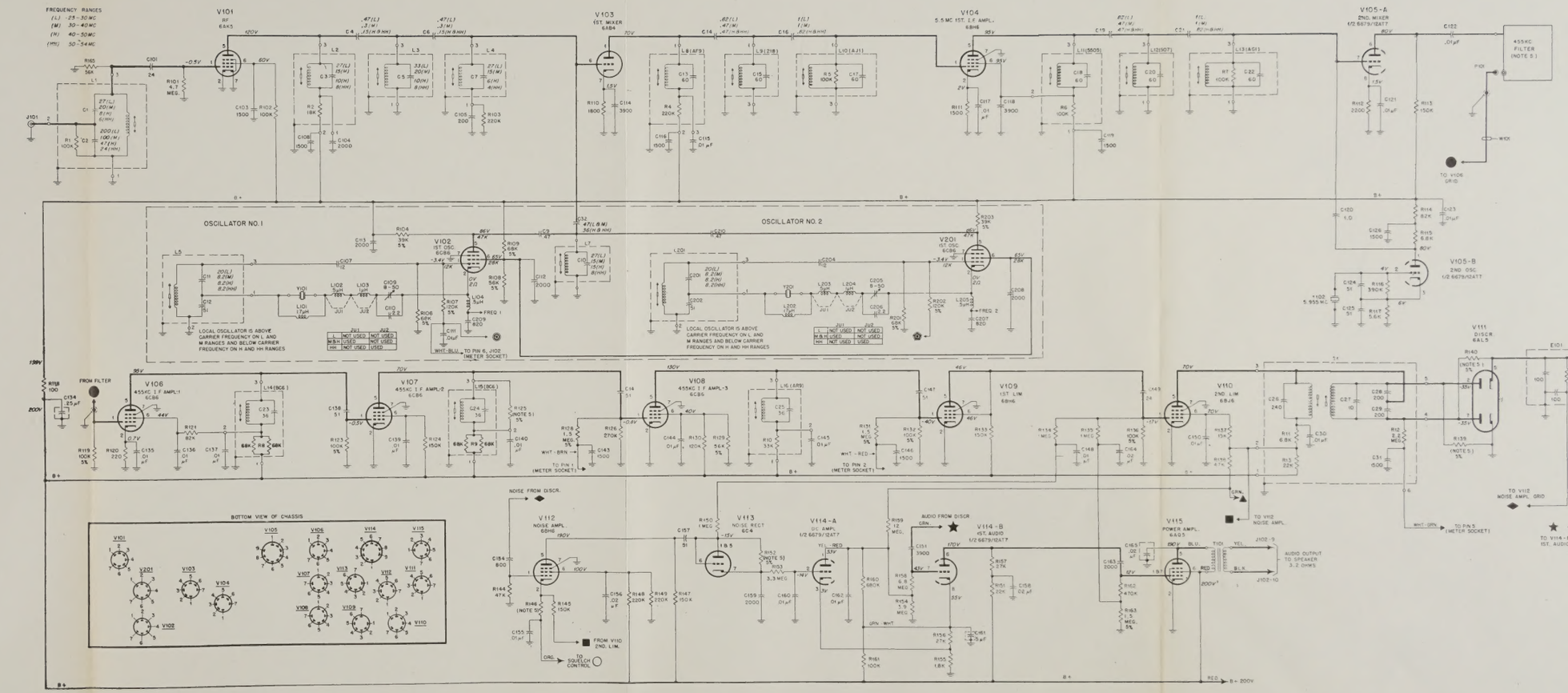
CRYSTAL

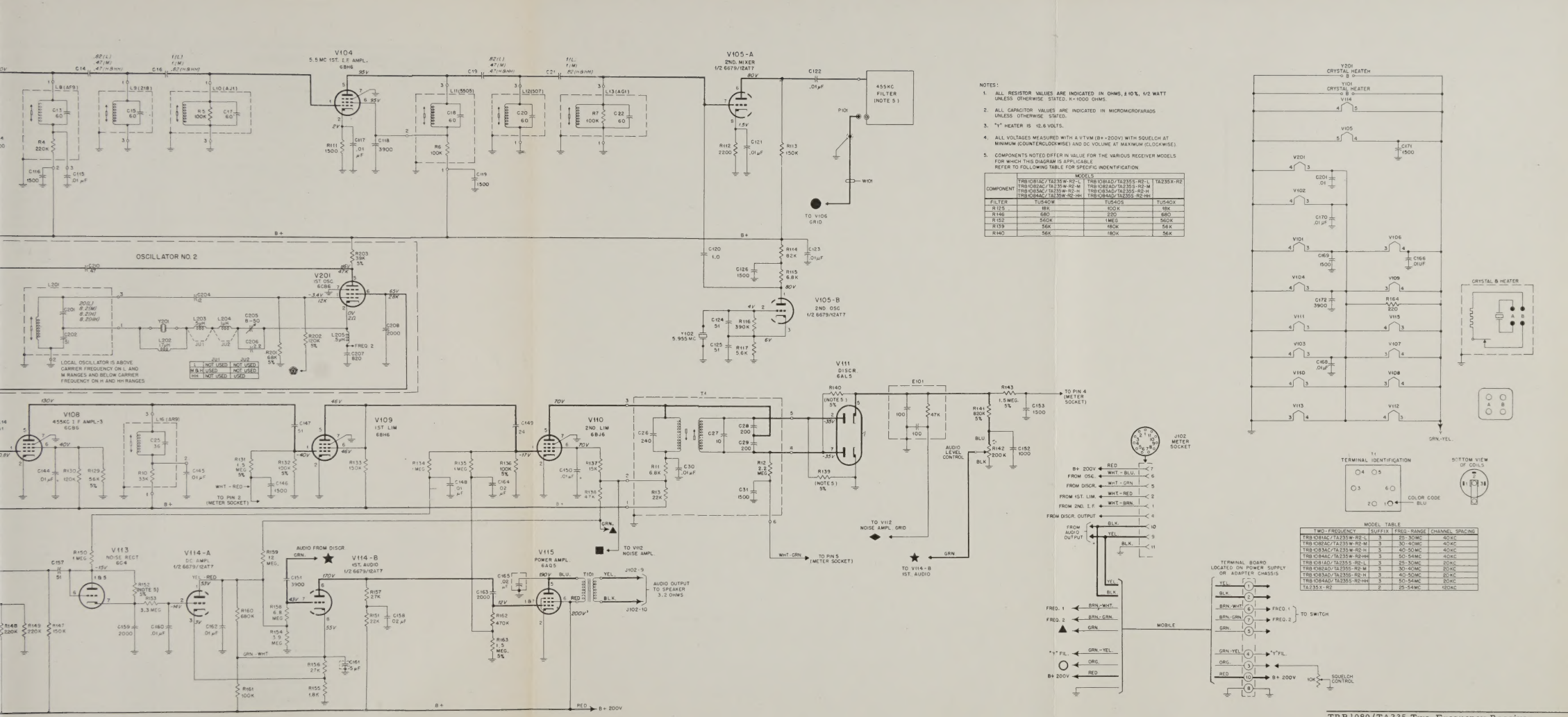
NOTE

Crystals are part of the Radio Set model. When ordering a receiver chassis only, crystals must be ordered separately. Crystal type number and operating frequency must be specified when ordering crystal.

Y101		CRYSTAL UNIT, quartz: Receiver Control:
	Type RM14A or Type RP14A	for 25-40 mc carrier freq; includes 6 volt heater unit
	or Type RM15A or Type RP15A	for 40-54 mc carrier freq; includes 6 volt heater unit
Y102	Type G04	Receiver IF; 5. 955 mc


Y201 (2-FREQ.)
L 201 COIL
L1 ANTENNA COIL
26K890035 TUBE SHIELD
V101
V201
L2 R-F COIL
L7 MULTIPLIER COIL
R-F COILS L3 L4
I-F COILS L12 L13
26A881244 TUBE SHIELD
V105
41A824763 CRYSTAL CLAMP
IF CRYSTAL
26A890034 TUBE SHIELD
V106
L14 I-F COIL
V113
V114
V111
V115
41A837078 TUBE HOLD-DOWN SPRING
64A840844 AUDIO LEVEL PLATE
Y101 (1-FREQ.)
41A850841 CRYSTAL CLAMP
46K848989 MOUNTING POST
L5 FIRST OSCILLATOR
V102
26A890034 TUBE SHIELD
L6 NOT USED
L8 I-F COIL
V103
L9 I-F COIL
V104
L10 I-F COIL
L11 I-F COIL
IF FILTER
V107
V108
L16 L15 I-F COILS
V109
V110
V112
T1 DISCRIMINATOR PRIMARY
C141
46A855066 MOUNTING POST


FREQUENCY RANGES
(L) 25-30 MC
(M) 30-40 MC
(H) 40-50 MC
(HH) 50-54 MC
V101 RF 6BK5
V103 1ST MIXER 6BA8
V104 5.5 MC 1ST I.F. AMPL. 6BH6
V105-A 2ND MIXER 1/2 6679/12AT7
V105-B 2ND OSC. 1/2 6679/12AT7
V102 1ST OSC. 6CB6
V201 1ST OSC. 6CB6
OSCILLATOR NO. 1
OSCILLATOR NO. 2
LOCAL OSCILLATOR IS ABOVE CARRIER FREQUENCY ON L AND M RANGES AND BELOW CARRIER FREQUENCY ON H AND HH RANGES
V106 455KC I.F. AMPL.-1 6CB6
V107 455KC I.F. AMPL.-2 6CB6
V108 455KC I.F. AMPL.-3 6CB6
V109 1ST LIM. 6BH6
V110 2ND LIM. 6BJ6
V111 DISCR. 6AL5
455KC FILTER (NOTE 5)
BOTTOM VIEW OF CHASSIS
V112 NOISE AMPL. 6BH6
V113 NOISE RECT. 6C4
V114-A DC AMPL. 1/2 6679/12AT7
V114-B 1ST AUDIO 1/2 6679/12AT7
V115 POWER AMPL. 6AQ5
AUDIO FROM DISCR.
AUDIO OUTPUT TO SPEAKER 3.2 OHMS
TO SQUELCH CONTROL
B+ 200V



NOTES:

1. ALL RESISTOR VALUES ARE INDICATED IN OHMS, ±10%, 1/2 WATT UNLESS OTHERWISE STATED. K=1000 OHMS.
2. ALL CAPACITOR VALUES ARE INDICATED IN MICROMICROFARADS UNLESS OTHERWISE STATED.
3. "Y" HEATER IS 12.6 VOLTS.
4. ALL VOLTAGES MEASURED WITH A VTVM (B+ =200V) WITH SQUELCH AT MINIMUM (COUNTERCLOCKWISE) AND DC VOLUME AT MAXIMUM (CLOCKWISE).
5. COMPONENTS NOTED DIFFER IN VALUE FOR THE VARIOUS RECEIVER MODELS FOR WHICH THIS DIAGRAM IS APPLICABLE. REFER TO FOLLOWING TABLE FOR SPECIFIC INDENTIFICATION.

COMPONENT	MODELS		
	TRB1081AC/TA235W-R2-L TRB1082AC/TA235W-R2-M TRB1083AC/TA235W-R2-H TRB1084AC/TA235W-R2-HH	TRB1081AD/TA2355-R2-L TRB1082AD/TA2355-R2-M TRB1083AD/TA2355-R2-H TRB1084AD/TA2355-R2-HH	TA235X-R2
FILTER	TU540W	TU540S	TU540X
R125	18K	100K	18K
R146	680	220	680
R152	560K	1MEG	560K
R139	56K	180K	56K
R140	56K	180K	56K

MODEL TABLE

TWO-FREQUENCY	SUFFIX	FREQ-RANGE	CHANNEL SPACING
TRB1081AC/TA235W-R2-L	3	25-30MC	40KC
TRB1082AC/TA235W-R2-M	3	30-40MC	40KC
TRB1083AC/TA235W-R2-H	3	40-50MC	40KC
TRB1084AC/TA235W-R2-HH	3	50-54MC	40KC
TRB1081AD/TA2355-R2-L	3	25-30MC	20KC
TRB1082AD/TA2355-R2-M	3	30-40MC	20KC
TRB1083AD/TA2355-R2-H	3	40-50MC	20KC
TRB1084AD/TA2355-R2-HH	3	50-54MC	20KC
TA235X-R2	2	25-54MC	120KC

TRB1080/TA235 Two-Frequency Receiver
Schematic Diagram
Motorola No. 63E854953-G
11/5/59-RCS

DESCRIPTION
stal: female; square; molded akelite base; chassis d rectangular; black c base; chassis mounted

Frequency
ows:

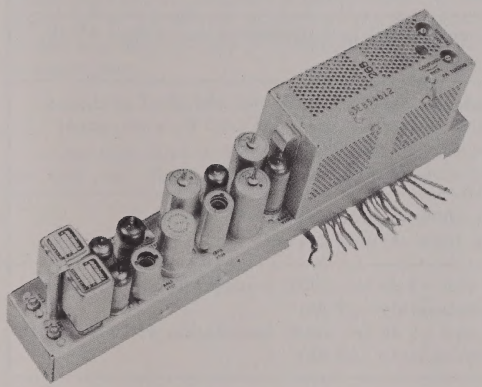
fixed: unless otherwise
11L
11M
11H
11HH
12
0
107
109
110
disc; 820 uuf ±10%;
w
104
207
4L
5L except includes C202
5M except includes C202
5H except includes C202
5HH except includes , C202
101
102
103
102
xed: carbon; unless ted
106
107
104
102
e: V101
stal: Y101

Y" IF Filter; annel Spacing
Y" IF Filter; annel Spacing
Y" IF Filter; hannel Spacing

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
CRYSTAL		
		NOTE Crystals are part of the Radio Set model. When ordering a receiver chassis only, crystals must be ordered separately. Crystal type number and operating frequency must be specified when ordering crystal.
		CRYSTAL UNIT, quartz:
Y101		Receiver Control:
	Type RM14A or Type RP14A or	for 25-40 mc carrier freq; includes 6 volt heater unit
	Type RM15A or Type RP15A	for 40-54 mc carrier freq; includes 6 volt heater unit
Y102	Type G04	Receiver IF: 5.955 mc
Y201		same as Y101

TRANSMITTER

CE 054



MODEL TA234-C2
TWO FREQUENCY TRANSMITTER

MODEL CHART

MODEL NUMBER	NUMBER OF FREQUENCIES	CRYSTALS REQUIRED
TTB1030AA/ TA234	1	one RN3-A
TTB1030AB/ TA234-C2	2	two RN3-A

1. DESCRIPTION

The Model TTB1030AA/TA234 is an FM radio transmitter designed for operation in the 25-54 mc band. The transmitter requires a separate power supply to provide operating voltages. The r-f power output of the transmitter is 25 watts or 50 watts, depending upon the power supply used. The r-f carrier frequency is crystal-controlled for maximum stability.

The basic transmitter components include a crystal-controlled oscillator, an angular phase modulator controlled by the MOTOROLA IDC (instantaneous deviation control) circuit, three stages of frequency multiplication, a final amplifier and a "T" section harmonic filter.

The MOTOROLA IDC circuit limits the modulation deviation to 100 percent. The deviation limit is set as required for the particular channel spacing application.

The TTB1030AB/TA234-C2 is a two-frequency version of the TTB1030AA/TA234 Transmitter. This unit transmits signals on two specific crystal-controlled frequencies in the 25-54 mc band. Only one frequency can be transmitted at a time. The two-frequency transmitter is the same as the single-frequency transmitter except for the addition of a second r-f oscillator deck and control crystal. An external switch is required for changing frequencies. This switch permits either the frequency #1 or the frequency #2 oscillator to function normally while it disables the other. This is done by grounding the oscillator cathode of the stage being used. The oscillator cathode circuit of the stage not in use is left open, i.e., the ground circuit is not complete. The two-frequency switch is ordinarily incorporated into the control unit used with the transmitter.

The two-frequency transmitter can be operated on frequencies which are separated by as much as 300 kc from circuit resonance without degradation of the single-frequency performance specifications. The circuits of the two-frequency transmitter are normally aligned to the higher of the two carrier frequencies to be transmitted.

SCHEMATIC DIAGRAM PARTS LIST

Reference:
Schematic Diagram
63E854953-O

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C1L	21R114440	ceramic; tubular, 27 uuf ±5%, 500 vdcw
C1M	21R474461	ceramic; tubular, 20 uuf ±5%, 500 vdcw
C1H	21R400073	ceramic; tubular, 8 uuf ± .5uuf; 500 vdcw
C1HH	21R400072	ceramic; tubular, 6 uuf ± .5uuf; 500 vdcw
C2L	21R2748	molded silver mica, 200 uuf ±10%, 500 vdcw
C2M	21R6631	molded silver mica; 100 uuf ±10%, 500 vdcw
C2H	21R116153	ceramic; tubular, 47 uuf ±10%; 500 vdcw
C2HH	21R31493	ceramic; tubular, 24 uuf ±5%, 500 vdcw; same as C1L
C3L	21K475262	ceramic; tubular, 15 uuf ±5%, 500 vdcw
C3M	21R490602	ceramic; tubular, 10 uuf ±5%, 500 vdcw; same as C1HH
C3H	21R490602	ceramic; tubular, 10 uuf ±5%, 500 vdcw; same as C1HH
C4L	21K83994	molded phenolic; tubular; .47 uuf ±20%, 500 vdcw
C4M	21K830201	molded phenolic; tubular; .3 uuf ±5%, 500 vdcw
C4H	21K881064	molded phenolic; tubular; .15 uuf ±5%, 500 vdcw; same as C4H
C4HH		same as C4H
C5L	21R120437	ceramic; tubular; 33 uuf ±5%, 500 vdcw; same as C1M; same as C3H; same as C1H; same as C4L; same as C4M; same as C4H; same as C3M; same as C1HH
C5M		
C5H		
C5HH		
C6L		
C6M		
C6H		
C6HH		
C7L		
C7M		
C7H		
C7HH	21R400404	ceramic; tubular; 4 uuf ± .6 uuf; 500 vdcw; NOT USED; same as C4L; same as C1L; same as C3M; same as C3H; same as C1HH
C8		
C9		
C10L		
C10M		
C10H		
C10HH		
C11L	21K849334	cer.; disc; 20 uuf ±5%; 500 vdcw
C11M	21K847873	cer.; disc; 8.2 uuf; ±.5%; 500 vdcw; same as C11M
C11H		same as C11M
C11HH		same as C11M
C12	21K840711	molded silver mica; 51 uuf ±5%; 500 vdcw
C13	21R400448	ceramic; tubular; 60 uuf ±10%; 500 vdcw
C14L	21K475679	molded phenolic; tubular; .82 uuf ±10%, 500 vdcw; same as C4L
C14M		same as C4L
C14H		same as C4L
C14HH		same as C4L
C15		same as C13
C16L	21C83959	molded; tubular; 1 uuf ± .2 uuf; 500 vdcw; same as C16L; same as C14L; same as C11L
C16M		
C16H		
C16HH		

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C17		same as C13
C18		same as C13
C19L		same as C14L
C19M		same as C4L
C19H		same as C4L
C19HH		same as C4L
C20		same as C13
C21L		same as C16L
C21M		same as C16L
C21H		same as C14L
C21HH		same as C14L
C22		same as C13
C23	21R87127	ceramic; tubular, 36 uuf ±5%; 500 vdcw; same as C23
C24		same as C23
C25		same as C23
C26	21K840448	molded silver mica; 240 uuf ±5%, 500 vdcw
C27	21K840811	ceramic; disc; 10 uuf ±5%, 500 vdcw
C28	21K840812	molded silver mica; 200 uuf ±5%; 500 vdcw; same as C28
C29		same as C28
C30	21B801139	ceramic, disc; .01 uf +80-20%; 600 vdcw
C31	21B800801	ceramic, disc; 1500 uuf GMV +100% max.; 500 vdcw
C32L		same as C4L
C32M		same as C4L
C32H	21K812041	molded phenolic; tubular; .36 uuf ±5%, 500 vdcw; same as C32H
C32HH		same as C32H
C101	21K840365	ceramic, disc; .24 uuf ±5%, 500 vdcw; NOT USED
C102		
C103	21B800801	ceramic, disc, 1500 uuf GMV +100%, max.; 500 vdcw
C104	21K837746	ceramic; disc; 2000 uuf ±10%, 500 vdcw
C105	21K840812	molded; silver mica; phenolic coated; 200 uuf ±5%, 500 vdcw; NOT USED
C106		
C107	21K847874	ceramic, disc, 12 uuf ±5%, 500 vdcw, NPO; same as C103; same as C103
C108		
C109	20B840719	variable; air; 8 uuf min. to 50 uuf max.
C110	21K842247	molded phenolic, tubular; 2.2 uuf ±10%, 500 vdcw; same as C30; same as C104; same as C104; ceramic, disc; 3900 uuf; ±10%, 500 vdcw; same as C30; same as C30; same as C30; same as C16L; same as C30; same as C103; same as C30; same as C114; same as C30; same as C103; same as C103; same as C124; same as C30; same as C114; same as C103; same as C16L; same as C30; same as C103; same as C30; same as C30; molded silver mica; phenolic coated; 51 uuf ±5%, 500 vdcw; same as C124; same as C103; NOT USED; NOT USED; NOT USED; NOT USED; NOT USED; NOT USED
C111		
C112		
C113		
C114	21K837996	
C115		
C116		
C117		
C118		
C119		
C120		
C121		
C122		
C123		
C124	21K840711	
C125		
C126		
C127		
C128		
C129		
C130		
C131		
C132		
C133		

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C134	8A892986	oil filled, tubular, .25 uf ±20%, 400 vdcw; same as C30; same as C30; same as C30; same as C30; same as C30; same as C124; NOT USED; same as C103; same as C30; same as C30; same as C103; same as C124; same as C30; same as C103; same as C124; same as C30; same as C30; same as C101; same as C30; same as C114; molded silver mica; 1000 uuf ±5%, 500 vdcw; same as C103; molded silver mica; phenolic coated; 800 uuf ±5%, 300 vdcw; same as C30; ceramic, disc; .02 uf +80-20%, 500 vdcw; same as C124; same as C156; same as C104; same as C30; electrolytic; tubular; 5 uf +100-15%, 150 vdcw; same as C30; same as C104; same as C156; oil (filled; tubular, .02 uf ±20%, 400 vdcw; same as C30; same as C103; same as C30; same as C103; same as C103; same as C114
C135		
C136		
C137		
C138		
C139		
C140		
C141		
C142		
C143		
C144		
C145		
C146		
C147		
C148		
C149		
C150		
C151		
C152	21K847601	
C153		
C154	21K840049	
C155		
C156	21B401029	
C157		
C158		
C159		
C160		
C161	23K890624	
C162		
C163		
C164		
C165	8K85984	
C166		
C167		
C168		
C169		
C170		
C171		
C172		
		CAPACITOR-RESISTOR ASSEMBLY; tubular; consisting of: dual CAPACITOR; printed circuit, silver paint on ceramic form; each section 100 uuf, 300 vdcw one RESISTOR; fixed; carbon; 47K ±20%
E101	21K842354	
		CONNECTOR, receptacle:
J101	9A87120	female; single contact; round molded mica filled phenolic base; for 1/8" diameter male pin connector
J102	9B86864	female, 11 contact, polarized; round molded black plastic base, chassis mounted, does not include 42A821428 RING, connector retainer, which must be ordered separately
		COIL,
L1L	24K824723	RF: Antenna, base stamped 723; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1L, C2L, R1

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
L1M	24K824722	COIL, RF: Antenna; base stamped 722; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1M, C2M, R1
L1H	24K825514	RF: Antenna; base stamped 514; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1H, C2H, R1
L1HH	24K881365	RF: Antenna; base stamped 365; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1HH, C2HH, R1
L2L	24K831225	RF: Plate; base stamped 225; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C2L, R2
L2M	24K831224	RF: Plate; base stamped 224; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C3M, R2
L2H	24K825525	RF: Plate; base stamped 525; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C3H, R2
L2HH	24K831366	RF: Plate; base stamped 366; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C3HH, R2
L3L	24K831221	RF: Coupling; base stamped 221; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5L
L3M	24K831220	RF: Coupling; base stamped 220; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5M
L3H	24K825516	RF: Coupling; base stamped 516; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5H
L3HH	24K825515	RF: Coupling; base stamped 515; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C5HH
L4L	24K824726	RF: Mixer Grid; base stamped 726; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7L
L4M	24B824336	RF: Mixer Grid; base stamped 336; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7M
L4H	24K824724	RF: Mixer Grid; base stamped 724; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7H
L4HH	24K831367	RF: Mixer Grid; base stamped 367; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C7HH
L5L	24B855844	RF: 1st Oscillator; base stamped BG7; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1LL, C1L
L5M	24B847871	RF: 1st Oscillator, base stamped AX4; includes 46K881276 CORE, adjustable tuning; coded ORANGE dot and C1L, C1L

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
L5H		COIL, same as L5M exc. inc. C11H, C12
L5HH		same as L5M exc. inc. C1HHH, C12
L6		NOT USED
L7L		same as L4L except Injection and includes C10L
L7M		same as L4M except Injection and includes C10M
L7H		same as L4M except Injection and includes C10H
L7HH		same as L5HH except Injection and includes C10HH
L8	24K837228	IF: 5.5 mc 1F - 1; base stamped AF9; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C13, R4
L9	24K830218	IF: 5.5 mc 1F - 2; base stamped 21i; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C15
L10	24K837470	IF: 5.5 mc 1F - 3; base stamped AJ1; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C17, R5
L11	24B825505	IF: 5.5 mc 1F - 4; base stamped 550; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C18
L12	24B825507	IF: 5.5 mc 1F - 5; base stamped 507; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C12
L13	24K837229	IF: 5.5 mc 1F - 6; base stamped AG1; includes 46K891111 CORE, adjustable tuning; coded LAV dot and C22, R7
L14	24K854048	IF: 2nd IF - 1; base stamped BC6; includes 46K891110 CORE, adjustable tuning; coded GRN dot and C23, R8
L15		same as L14 except 2nd IF - 2 and includes C24, R9
L16	24K840842	IF: 2nd IF - 3; base stamped AR9; includes 46K891110 CORE, adjustable tuning; coded GRN dot and C25, R10
L101	24K847869	RF; choke, 1.7 uh; coded BLK-GRN dot
L102	24K847870	RF; choke, .5 uh; coded BLK-VIO dot
L103	24B840042	RF; choke, 1 uh, coded RED-BLK dot
L104		same as L102
P101	28K849416	CONNECTOR, plug; male, single contact; round brown bakelite wafer insulator; cable mounted
		RESISTOR, fixed; carbon; unless otherwise stated
R1	6R6031	100K ±10%, 1/2 w; ins.
R2	6R5591	18K ±10%, 1/2 w; ins. NOT USED
R3		
R4	6R6407	220K ±10%, 1/2 w; ins.
R5		same as R1
R6		same as R1
R7		same as R1
R8		effective resistance 33K; consists of: two (2) 6R6074 RESISTORS, fixed; carbon; each unit 68K ±10%, 1/2 w, ins.; parallel connected

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R9		RESISTOR, fixed: carbon, unless otherwise stated; same as R8
R10	6R6410	33K ±10%, 1/2 w; ins.
R11	6R6428	6.8K ±10%, 1/2 w; ins.
R12	6R6433	2.2 meg ±10%, 1/2 w; ins.
R13	6R6397	22K ±10%, 1/2 w; ins.
R101	6R6446	4.7 meg ±10%, 1/2 w; ins.
R102		same as R1
R103		same as R4
R104	6R400076	39K ±5%, 1/2 w; ins.
R105		NOT USED
R106	6R6479	68K ±5%, 1/2 w; ins.
R107	6R2049	120K ±5%, 1/2 w; ins.
R108	6R401006	56K ±5%; 1/2 w; ins.
R109		same as R106
R110	6R2089	1.8K ±10%, 1/2 w; ins.
R111	6R6038	1.5K ±10%, 1/2 w; ins.
R112	6R6069	2.2K ±10%, 1/2 w; ins.
R113	6R6398	150K ±10%, 1/2 w; ins.
R114	6R5644	82K ±10%, 1/2 w; ins.
R115		same as R11
R116	6R5646	390K ±10%, 1/2 w; ins.
R117	6R6117	5.6K ±10%, 1/2 w; ins.
R118	6R6326	100 ohm ±10%, 1/2 w; ins.
R119	6R5553	100K ±5%, 1/2 w; ins.
R120	6R6270	220 ohm ±10%; 1/2 w; ins.
R121		same as R114
R122		NOT USED
R123		same as R119
R124		same as R113
R125	6R488095	18K ±5%, 1/2 w; ins.; used only in TA235W-R2 and TA235X-R2
	or 6R5553	100K ±5%, used only in TA235S-R2
R126	6R6414	270K ±10%, 1/2 w; ins.
R127		NOT USED
R128	6R400228	1.5 meg ±5%, 1/2 w; ins.
R129		same as R108
R130	6R5631	120K ±10%, 1/2 w; ins.
R131		same as R128
R132		same as R119
R133		same as R113
R134	6R6046	1 meg ±10%; 1/2 w; ins.
R135		same as R134
R136		same as R119
R137	6R6477	15K ±10%, 1/2 w; ins.
R138	6R6048	47K ±10%, 1/2 w; ins.
R139	6R401006	56K; used only in TA235W-R2 and TA235X-R2
	or 6R2061	180K ±5%; used only in TA235S-R2
R140		same as R139
R141	6R5773	820K ±10%,
R142	18K845110	variable; 200K ±20%; 1/4 w
R143		same as R128
R144		same as R138
R145		same as R113
R146	6R6040	680 ohm; used only in TA235W-R2 and TA235X-R2
	or 6R6270	220 ohm; used only in TA235S-R2
R147		same as R113
R148		same as R4
R149		same as R4
R150		same as R134
R151		same as R13
R152	6R5796	560K ±5%; 1/2 w; ins, used only in TA235W-R2 and TA235X-R2
	or 6R5587	1 megohm ±5%; 1/2 w; ins.; used only in TA235S-R2
R153	6R6497	3.3 meg ±10%, 1/2 w; ins.
R154	6R490110	3.9 meg ±10%, 1/2 w; ins.
R155		same as R110
R156	6R6434	27K ±10%, 1/2 w; ins.
R157		same as R156
R158	6R2097	6.8 meg ±10%, 1/2 w; ins.
R159	6R400334	12 meg ±10%, 1/2 w; ins.
R160	6R6475	680K ±10%, 1/2 w; ins.

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R161		RESISTOR, fixed: carbon, unless otherwise stated; same as R1
R162	6R6377	47K ±10%, 1/2 w; ins.
R163		same as R128
R164		same as R120
R165	6R6378	56K ±10%; 1/2 w; ins.
		TRANSFORMER,
T1	1V842353	RF; discrim.; coded BLU dot; inc., two 76A821495 CORE, adjust tuning; coded YEL dot and C26, C27, C28, C29
T101	25K847479	AF; output; 5000 ohm at 55 ma to 3 ohm
		TUBE,
V101	6AK5	electron
V102	6CB6	electron
V103	6AB4	electron
V104	6BH6	electron
V105	12AT7	electron
V106	6CB6	electron
V107		same as V106
V108		same as V106
V109		same as V104
V110	6BJ6	electron
V111	6AL5	electron
V112		same as V104
V113	6C4	electron
V114		same as V105
V115	6AQ5	electron
W101	1V857900	LINE, RF transmission; assembly includes; 30B475378 CABLE, RF; coaxial; RG-58A/U; 4" length required
		Reference part P101
XV101	9B834083	SOCKET, tube; female; 7 contact; miniature; molded mica filled phenolic base; saddle mounting; includes center shield and tube shield base
XV102		same as XV101
XV103	9K87124	7 contact; miniature, molded mica filled phenolic base; saddle mounting includes center shield
XV104		same as XV103
XV105	9B881243	9 contact; miniature; molded black phenolic base, saddle mounting; includes center shield and tube shield base
XV106	9K849460	9 contact; miniature, molded mica filled phenolic base; saddle mounting; includes center shield and tube shield base
XV107		same as XV105
XV108	9B87123	7 contact; miniature; molded black phenolic base, saddle mounting; includes center shield
XV109		same as XV108
XV110		same as XV108
XV111		same as XV108
XV112		same as XV108
XV113		same as XV108
XV114	9B86868	9 contact; miniature; molded black phenolic base; saddle mounting; includes center shield
XV115		same as XV108

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
XY101	9K857508	SOCKET, crystal; female; 4 contact; square; molded black bakelite base; chassis mounted
XY102	9K861367	2 contact; rectangular; black phenolic base; chassis mounted

Components unique for Two-Frequency Receiver Chassis are as follows:

		CAPACITOR, fixed: unless otherwise stated
C201L		same as C11L
C201M		same as C11M
C201H		same as C11H
C201HH		same as C11HH
C202		same as C12
C203		NOT USED
C204		same as C107
C205		same as C109
C206		same as C110
C207	21B837745	ceramic, disc; 820 uuf ±10%; 500 vdcw
C208		same as C104
C209		same as C207
C210		same as C4L
		COIL,
L201L		same as L5L except includes C201L, C202
L201M		same as L5M except includes C201M, C202
L201H		same as L5H except includes C201H, C202
L201HH		same as L5HH except includes C201HH, C202
L202		same as L101
L203		same as L102
L204		same as L103
L205		same as L102
		RESISTOR, fixed; carbon; unless otherwise stated
R201		same as R106
R202		same as R107
R203		same as R104
		TUBE,
V201		same as V102
		SOCKET, tube;
XV201		same as XV101
		SOCKET, crystal;
XY201		same as XY101

FILTER		
	TU540S	"PERMAKAY" IF Filter; 30 KC Channel Spacing
	TU540W	"PERMAKAY" IF Filter; 60 KC Channel Spacing
	TU540X	"PERMAKAY" IF Filter; 120 KC Channel Spacing

REFERENCE SYMBOL
CRYSTAL
Y101
Y102
Y201

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed; unless otherwise stated
		same as C13
		same as C13
		same as C14L
		same as C4L
		same as C4L
		same as C4L
		same as C13
		same as C16L
		same as C14L
		same as C14L
		same as C13
		ceramic, tubular; 36 uuf ±5%; 500 vdcw
		same as C23
		molded silver mica; 240 uuf ±5%; 500 vdcw
		ceramic, disc; 10 uuf ±5%; 500 vdcw
		molded silver mica; 200 uuf ±5%; 500 vdcw
		same as C28
		ceramic, disc; .01 uf +80-20%; 600 vdcw
		ceramic, disc; 1500 uuf GMV +100% max.; 500 vdcw
		same as C4L
		same as C4L
		molded phenolic; tubular; .36 uuf ±5%; 500 vdcw
		same as C32H
		ceramic, disc; 24 uuf ±5%; 500 vdcw
		NOT USED
		ceramic, disc; 1500 uuf GMV +100%, max.; 500 vdcw
		ceramic, disc; 2000 uuf ±10%; 500 vdcw
		molded; silver mica; phenolic coated; 200 uuf ±5%; 500 vdcw
		NOT USED
		ceramic, disc; 12 uuf ±5%; 500 vdcw; NPO
		same as C103
		variable; air; 8 uuf min. to 50 uuf max.
		molded phenolic; tubular; 2.2 uuf ±10%; 500 vdcw
		same as C30
		same as C104
		same as C104
		ceramic, disc; 3900 uuf; ±10%; 500 vdcw
		same as C30
		same as C103
		same as C30
		same as C114
		same as C103
		same as C30
		same as C16L
		same as C30
		same as C30
		same as C30
		molded silver mica; phenolic coated; 51 uuf ±5%; 500 vdcw
		same as C124
		same as C103
		NOT USED
		NOT USED
		NOT USED
		NOT USED
		NOT USED
		NOT USED

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C134	8A892986	CAPACITOR, fixed; unless otherwise stated oil filled, tubular, .25 uf ±20%, 400 vdcw
C135		same as C30
C136		same as C30
C137		same as C30
C138		same as C124
C139		same as C30
C140		same as C30
C141		same as C124
C142		NOT USED
C143		same as C103
C144		same as C30
C145		same as C30
C146		same as C103
C147		same as C124
C148		same as C30
C149		same as C101
C150		same as C30
C151		same as C114
C152	21KB47601	molded silver mica; 1000 uuf ±5%; 500 vdcw
C153		same as C103
C154	21KB40049	molded silver mica, phenolic coated; 800 uuf ±5%; 300 vdcw
C155		same as C30
C156	21B101029	ceramic, disc; .02 uf +80-20%; 500 vdcw
C157		same as C124
C158		same as C156
C159		same as C104
C160		same as C30
C161	23KB90624	electrolytic; tubular; 5 uf +100-15%; 150 vdcw
C162		same as C30
C163		same as C104
C164		same as C156
C165	8K85984	oil filled, tubular, .02 uf ±20%, 400 vdcw
C166		same as C30
C167		same as C103
C168		same as C30
C169		same as C103
C170		same as C30
C171		same as C103
C172		same as C114
		CAPACITOR-RESISTOR ASSEMBLY;
E101	21KB42354	tubular; consisting of: dual CAPACITOR; printed circuit, silver paint on ceramic form; each section 100 uuf; 300 vdcw one RESISTOR; fixed; carbon; 47K ±20%
		CONNECTOR, receptacle:
J101	9A87120	female; single contact; round molded mica filled phenolic base, for 1/8" diameter male pin connector
J102	9B86864	female; 11 contact, polarized; round molded black plastic base, chassis mounted; does not include 42A82142B RING, connector retainer; which must be ordered separately
		COIL,
L1L	24KB24723	RF: Antenna, base stamped 723; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C1L, C2L, R1

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		COIL,
L1M	24KB24722	RF: Antenna, base stamped 722; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C1M, C2M, R1
L1H	24KB25514	RF: Antenna, base stamped 514; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C1H, C2H, R1
L1HH	24KB81365	RF: Antenna, base stamped 365; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C1HH, C2HH, R1
L2L	24KB31225	RF: Plate, base stamped 225; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C3L, R2
L2M	24KB31224	RF: Plate, base stamped 224; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C3M, R2
L2H	24KB25525	RF: Plate, base stamped 525; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C3H, R2
L2HH	24KB31366	RF: Plate, base stamped 366; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C3HH, R2
L3L	24KB31221	RF: Coupling; base stamped 221; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C5L
L3M	24KB31220	RF: Coupling; base stamped 220; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C5M
L3H	24KB25516	RF: Coupling; base stamped 516; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C5H
L3HH	24KB25515	RF: Coupling; base stamped 515; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C5HH
L4L	24KB24726	RF: Mixer Grid; base stamped 726; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C7L
L4M	24KB24336	RF: Mixer Grid; base stamped 336; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C7M
L4H	24KB24724	RF: Mixer Grid; base stamped 724; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C7H
L4HH	24KB31367	RF: Mixer Grid; base stamped 367; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C7HH
L5L	24KB55844	RF: 1st Oscillator; base stamped BC7; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C11L, C12
L5M	24KB47871	RF: 1st Oscillator, base stamped AX4; includes 46KB81276 CORE, adjustable tuning; coded ORANGE dot and C11, C12

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
L5H		COIL,
L5HH		same as L5M exc. inc. C11H, C12
L6		same as L5M exc. inc. C11HH, C12
L7L		NOT USED
L7M		same as L4L except Injection and includes C10L
L7H		same as L4M except Injection and includes C10M
L7HH		same as L4H except Injection and includes C10H
L8	24KB37228	same as L3HH except Injection and includes C10HH
L9	24KB30218	IF: 5.5 mc 1F - 1; base stamped AF9; includes 46KB91111 CORE, adjustable tuning; coded LAV dot and C13, R4
L10	24KB37470	IF: 5.5 mc 1F - 2; base stamped 210; includes 46KB91111 CORE, adjustable tuning; coded LAV dot and C15
L11	24KB25505	IF: 5.5 mc 1F - 3; base stamped AJ1; includes 46KB91111 CORE, adjustable tuning; coded LAV dot and C17, R5
L12	24KB25507	IF: 5.5 mc 1F - 4; base stamped 550; includes 46KB91111 CORE, adjustable tuning; coded LAV dot and C18
L13	24KB37229	IF: 5.5 mc 1F - 5; base stamped 507; includes 46KB91111 CORE, adjustable tuning; coded LAV dot and C12
L14	24KB54048	IF: 5.5 mc 1F - 6; base stamped AG1; includes 46KB91111 CORE, adjustable tuning; coded LAV dot and C22, R7
L15		IF: 2nd 1F - 1; base stamped BC6; includes 46KB91110 CORE, adjustable tuning; coded GRN dot and C23, R8
L16	24KB40842	same as L14 except 2nd IF - 2 and includes C24, R9
L101	24KB47869	IF: 2nd 1F - 3; base stamped AR9; includes 46KB91110 CORE, adjustable tuning; coded GRN dot and C25, R10
L102	24KB47870	RF: choke, 1.7 uh; coded BLK-GRN dot
L103	24KB40042	RF: choke, .5 uh; coded BLK-VIO dot
L104		RF: choke, 1 uh, coded RED-BLK dot
P101	28KB49416	same as L102
		CONNECTOR, plug; male single contact; round brown bakelite wafer insulator; cable mounted
R1	6R6031	RESISTOR, fixed; carbon, unless otherwise stated 100K ±10%, 1/2 w; ins.
R2	6R5591	18K ±10%, 1/2 w, ins.
R3		NOT USED
R4	6R6407	220K ±10%, 1/2 w; ins.
R5		same as R1
R6		same as R1
R7		same as R1
R8		effective resistance 33K; consists of: two (2) 6R6074 RESISTORS, fixed; carbon; each unit 68K ±10%, 1/2 w, ins.; parallel connected

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R9		RESISTOR, fixed; carbon, unless otherwise stated same as R8
R10	6R6410	33K ±10%, 1/2 w, ins.
R11	6R6428	6.8K ±10%, 1/2 w; ins.
R12	6R6433	2.2 meg ±10%, 1/2 w; ins.
R13	6R6397	22K ±10%, 1/2 w; ins.
R101	6R6446	4.7 meg ±10%, 1/2 w; ins.
R102		same as R1
R103		same as R4
R104	6R400076	39K ±5%, 1/2 w; ins.
R105		NOT USED
R106	6R6479	68K ±5%, 1/2 w; ins.
R107	6R2049	120K ±5%, 1/2 w; ins.
R108	6R401006	56K ±5%, 1/2 w; ins.
R109		same as R106
R110	6R2089	1.8K ±10%, 1/2 w; ins.
R111	6R6038	1.5K ±10%, 1/2 w; ins.
R112	6R6069	2.2K ±10%, 1/2 w; ins.
R113	6R6398	150K ±10%, 1/2 w; ins.
R114	6R5644	82K ±10%, 1/2 w; ins.
R115		same as R11
R116	6R5646	390K ±10%, 1/2 w; ins.
R117	6R6117	5.6K ±10%, 1/2 w; ins.
R118	6R6326	100 ohm ±10%, 1/2 w; ins.
R119	6R5553	100K ±5%, 1/2 w, ins.
R120	6R6270	220 ohm ±10%, 1/2 w; ins.
R121		same as R114
R122		NOT USED
R123		same as R119
R124		same as R113
R125	6R488095	18K ±5%, 1/2 w; ins.; used only in TA235W-R2 and TA235X-R2
	or 6R5553	100K ±5%, used only in TA235S-R2
R126	6R6414	270K ±10%, 1/2 w; ins.
R127		NOT USED
R128	6R400228	1.5 meg ±5%, 1/2 w; ins.
R129		same as R108
R130	6R5631	120K ±10%, 1/2 w; ins.
R131		same as R128
R132		same as R119
R133		same as R113
R134	6R6046	1 meg ±10%, 1/2 w; ins.
R135		same as R134
R136		same as R119
R137	6R6477	15K ±10%, 1/2 w; ins.
R138	6R6048	47K ±10%, 1/2 w; ins.
R139	6R401006	56K; used only in TA235W-R2 and TA235X-R2
	or 6R2061	180K ±5%; used only in TA235S-R2
R140		same as R139
R141	6R5773	820K ±10%
R142	18K845110	variable; 200K ±20%; 1/4 w
R143		same as R128
R144		same as R138
R145		same as R113
R146	6R6040	680 ohm; used only in TA235W-R2 and TA235X-R2
	or 6R6270	220 ohm; used only in TA235S-R2
R147		same as R113
R148		same as R4
R149		same as R4
R150		same as R134
R151		same as R13
R152	6R5796	560K ±5%, 1/2 w; ins, used only in TA235W-R2 and TA235X-R2
	or 6R5587	1 megohm ±5%; 1/2 w; ins.; used only in TA235S-R2
R153	6R6497	3.3 meg ±10%, 1/2 w; ins.
R154	6R490110	3.9 meg ±10%, 1/2 w; ins.
R155		same as R110
R156	6R6434	27K ±10%, 1/2 w; ins.
R157		same as R156
R158	6R2097	6.8 meg ±10%, 1/2 w; ins.
R159	6R400334	12 meg ±10%, 1/2 w; ins.
R160	6R6475	680K ±10%, 1/2 w; ins.

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		RESISTOR, fixed; carbon; unless otherwise stated
R161		same as R1
R162	6R6377	47K ±10%, 1/2 w; ins.
R163		same as R128
R164		same as R120
R165	6R6378	56K ±10%, 1/2 w; ins.
T101	25KB47479	TRANSFORMER, RF: discrim.; coded BLU dot; inc., two 76AB21495 CORE, adjust tuning; coded YEL dot and C26, C27, C28, C29 C30, C31, R11, R12, R13 AF: output; 5000 ohm at 55 ma to 3 ohm
V101	6AK5	TUBE, electron
V102	6CB6	electron
V103	6AB4	electron
V104	6BH6	electron
V105	12AT7	electron
V106	6CB6	electron
V107		same as V106
V108		same as V106
V109		same as V104
V110	6BJ6	electron
V111	6AL5	electron
V112		same as V104
V113	6C4	electron
V114		same as V105
V115	6AQ5	electron
W101	1V857900	LINE, RF transmission; assembly includes: 30B475378 CABLE, RF; coaxial; RG-58A/U; 47" length required Reference part P101
XV101	9B834083	SOCKET, tube; female; 7 contact; miniature; molded mica filled phenolic base; saddle mounting; includes center shield and tube shield base
XV102		same as XV101
XV103	9K87124	7 contact; miniature; molded mica filled phenolic base; saddle mounting includes center shield
XV104		same as XV103
XV105	9B881243	9 contact; miniature; molded black phenolic base; saddle mounting; includes center shield and tube shield base
XV106	9K849460	9 contact; miniature; molded mica filled phenolic base; saddle mounting; includes center shield and tube shield base
XV107		same as XV106
XV108	9B87123	7 contact; miniature; molded black phenolic base; saddle mounting; includes center shield
XV109		same as XV108
XV110		same as XV108
XV111		same as XV108
XV112		same as XV108
XV113		same as XV108
XV114	9B86868	9 contact; miniature; molded black phenolic base; saddle mounting; includes center shield
XV115		same as XV108

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
XY101	9K857508	SOCKET, crystal; female; 4 contact, square; molded black bakelite base; chassis mounted
XY102	9K861367	2 contact; rectangular; black phenolic base; chassis mounted

Components unique for Two-Frequency Receiver Chassis are as follows:

C201L		CAPACITOR, fixed; unless otherwise stated same as C11L
C201M		same as C11M
C201H		same as C11H
C201HH		same as C11HH
C202		same as C12
C203		NOT USED
C204		same as C107
C205		same as C109
C206		same as C110
C207	21B837745	ceramic, disc; 820 uuf ±10%; 500 vdcw
C208		same as C104
C209		same as C207
C210		same as C4L
L201L		COIL, same as L5L except includes C201L, C202
L201M		same as L5M except includes C201M, C202
L201H		same as L5H except includes C201H, C202
L201HH		same as L5HH except includes C201HH, C202
L202		same as L101
L203		same as L102
L204		same as L103
L205		same as L102
R201		RESISTOR, fixed; carbon; unless otherwise stated same as R106
R202		same as R107
R203		same as R104
V201		TUBE, same as V102
XV201		SOCKET, tube; same as XV101
XY201		SOCKET, crystal; same as XY101

FILTER

	TU540S	"PERMAKAY" IF Filter; 30 KC Channel Spacing
	TU540W	"PERMAKAY" IF Filter; 60 KC Channel Spacing
	TU540X	"PERMAKAY" IF Filter; 120 KC Channel Spacing

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CRYSTAL
		NOTE Crystals are part of the Radio Set model. When ordering a receiver chassis only, crystals must be ordered separately. Crystal type number and operating frequency must be specified when ordering crystal.
Y101		CRYSTAL UNIT, quartz; Receiver Control: Type RM14A for 25-40 mc carrier freq; includes 6 volt heater unit or Type RP16A for 40-54 mc carrier freq; includes 6 volt heater unit
Y102	Type C04	Receiver IF; 5.955 mc
Y201		same as Y101

GUARANTEED PERFORMANCE SPECIFICATIONS

BASIC UNIT	TTB1030AA/TA234 Series (25-54 mc)
RF POWER OUTPUT	25 watts, 30 watts or 50 watts - depending upon power supply used.
CRYSTAL MULTIPLICATION	Twelve (12) times
POWER SUPPLY	Separate transistorized power supply operating from a 12 volt dc positive or negative ground source.
SPURIOUS AND HARMONIC EMISSION	All spurious and harmonic emissions are attenuated more than 60 db. below carrier level.
FREQUENCY STABILITY AND TEMPERATURE RANGE	oven type crystal unit maintains carrier within ±0.0005% of assigned center frequency from -30 C. to +60 C. ambient (+25 C. reference)
MODULATION	40F3: ±15 kc deviation for 100% at 1000 cycles 20F3: ± 5 kc deviation for 100% at 1000 cycles
AUDIO INPUT LEVEL	factory connection: 0.25 volt ±3 db for 100% modulation at 1000 cps (approximately -17 db) optional connection: 0.18 volt ±3 db for 100% modulation at 1000 cps (approximately -20 db)
TUBE COMPLEMENT AND FUNCTION	(1) 6AK6 - Oscillator (1-Freq.) 6AQ5 - Doubler Driver or (2) 6AK6 - Oscillator (2-Freq.) 6146 - Power Amplifier (1) 12AT7 - Mod. Buffer-Doubler 6BH6 - I.D.C. Amplifier 6AK6 - Tripler 6AL5 - Clipper
NUMBER OF TUNED CIRCUITS	9 following the modulator including 3 double permeability tuned multiplier stages, a multiple adjusted output circuit and an output harmonic filter.
DIMENSIONS	2-3/8" wide x 5-1/4" high x 15" long
WEIGHT	3-3/4 lbs.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

F.C.C. License Designation: CC1008

2. CHASSIS COMPLEMENT

The Model TTB1030AA/TA234 single-frequency transmitter chassis consists of the following items:

One Model TU548 Single-Frequency Transmitter basic chassis, which includes:

One TK119 Coil Kit

The coil kit used depends upon the assigned frequency of the transmitter. The coil kit model number is assigned a letter suffix symbol. Refer to the parts list in back of the transmitter schematic diagram for a complete list of coil kit designations.

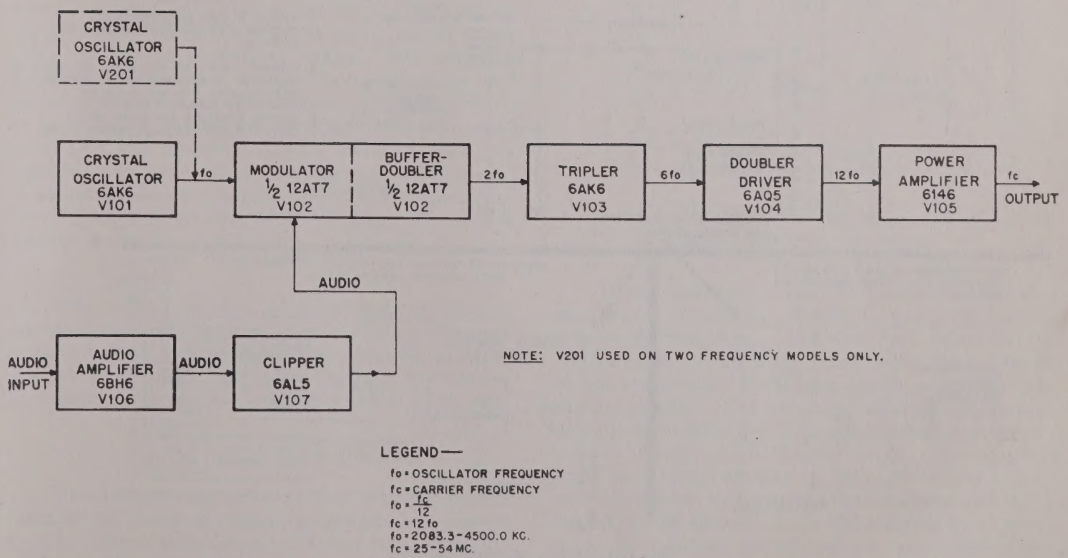
One type RN3-A Control Crystal is required for use with this transmitter. The crystal is a separate item and is not included as part of the transmitter. See the FOREWORD of this manual for ordering information.

The Model TTB1030AB/TA234-C2 two-frequency transmitter chassis includes a Model TU548-C2 Basic two-frequency transmitter chassis; however, the same coil kit is used in the two-frequency model as for the single-frequency model.

Two type RN3-A Control Crystals are required for use with the two-frequency transmitter. The crystal is a separate item and is not included as part of the transmitter. See the FOREWORD of this manual for ordering information.

3. CIRCUIT OPERATION

Stage-by-stage signal flow and operating frequencies are shown on the transmitter block diagram.



a. Audio Input and Amplifier Stage

Refer to the diagram below for a simplified illustration of the audio input circuit.

(1) Circuit Paths

There are two circuit paths involved in the transmitter audio input circuit. These are: (a) microphone dc input, and, (b) microphone audio output.

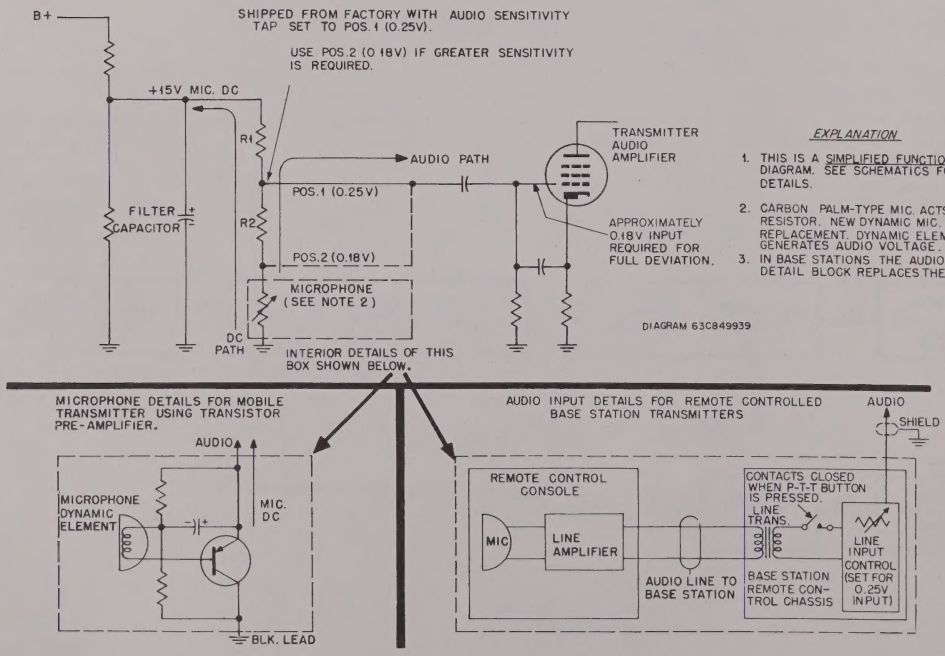
(a) Microphone Dc Input

The microphone dc input (called "talking current") is taken from a B+ voltage source in the transmitter. A resistor network drops the microphone dc voltage to approximately 15 volts dc. A relatively large capacitor is connected across the circuit to provide additional filtering. The dc path leads through two resistors, R1 and R2, to the microphone. These resistors drop the voltage to about 4 volts at the microphone input. The dc path leads through the microphone cartridge, returning to ground through the cable shield.

(b) Microphone Audio Output

The microphone acts like a voltage generator in the circuit. Sound waves received by the microphone element vary the voltage in accordance with the voice frequency and intensity. This results in voltage changes at the microphone output as a person speaks into the microphone.

There are two "audio sensitivity" taps in the microphone output circuit. As it is shipped from the factory, the circuit is wired so that position 1 tap is used. The lower tap, position 2, connects the full output to the transmitter audio amplifier input. However, the currently produced MOTOROLA microphones develop a sufficiently high audio input level to provide full transmitter deviation across resistor R2. Placing the tap on the other side of R2 permits a lower microphone level to operate the transmitter. Generally speaking the position 1 tap is used for all base station and mobile applications in current production. The position 2 tap can be used if greater audio sensitivity is required in special applications.


B+
SHIPPED FROM FACTORY WITH AUDIO SENSITIVITY TAP SET TO POS. 1 (0.25V).
USE POS. 2 (0.18V) IF GREATER SENSITIVITY IS REQUIRED.
+15V MIC. DC
R1
AUDIO PATH
TRANSMITTER AUDIO AMPLIFIER
POS. 1 (0.25V)
FILTER CAPACITOR
R2
APPROXIMATELY 0.18V INPUT REQUIRED FOR FULL DEVIATION.
POS. 2 (0.18V)
MICROPHONE (SEE NOTE 2)
DC PATH
INTERIOR DETAILS OF THIS BOX SHOWN BELOW.
EXPLANATION
1. THIS IS A SIMPLIFIED FUNCTIONAL DIAGRAM. SEE SCHEMATICS FOR EXACT DETAILS.
2. CARBON PALM-TYPE MIC. ACTS LIKE VARIABLE RESISTOR. NEW DYNAMIC MIC. IS A DIRECT REPLACEMENT. DYNAMIC ELEMENT GENERATES AUDIO VOLTAGE.
3. IN BASE STATIONS THE AUDIO INPUT DETAIL BLOCK REPLACES THE MIC. BLOCK.
DIAGRAM 63C849939
MICROPHONE DETAILS FOR MOBILE TRANSMITTER USING TRANSISTOR PRE-AMPLIFIER.
AUDIO
MICROPHONE DYNAMIC ELEMENT
MIC. DC
BLK. LEAD
AUDIO INPUT DETAILS FOR REMOTE CONTROLLED BASE STATION TRANSMITTERS
AUDIO
SHIELD
REMOTE CONTROL CONSOLE
MIC
LINE AMPLIFIER
AUDIO LINE TO BASE STATION
CONTACTS CLOSED WHEN P-T-T BUTTON IS PRESSED.
LINE TRANS.
BASE STATION REMOTE CONTROL CHASSIS
LINE INPUT CONTROL (SET FOR 0.25V INPUT)

SIMPLIFIED AUDIO INPUT

63C849939

The microphone audio output is connected through a coupling capacitor to the grid of the transmitter audio amplifier. The signals are then passed through the IDC circuit and used to modulate the transmitter.

(2) Microphone and Audio Input Details

The boxed-in detail in the lower left hand side of the diagram shows the mobile transmitter application. This is an enlarged drawing of the microphone shown in the upper half of the diagram. The audio output shown in the detail connects to the lower end of R2, the same as shown for the microphone output.

The dynamic microphone incorporates a transistorized pre-amplifier which brings the output up to the 0.25 volt level. The microphone dc input supplies the current for energizing the transistor.

b. IDC Circuit

To trace the IDC circuitry refer to Schematic Diagram 63E854612 which is part of this section.

The incoming signals from the audio amplifier, are coupled to the clipper tube. The clipper stage limits the amplitude of the signals which pass on to the modulator stage. The clipping level is set so that some clipping of peaks will occur in the normal input signal. Signals applied to the clipper below the clipping level are unaffected by the clipper; signals which exceed the clipping level are clipped at the top and bottom. A small amount of clipping produces a trapezoidal waveform; a large amount of clipping produces a square wave (see Fig. 1).

The clipper output is integrated, producing an approximately triangular waveform. The approach to the triangular shape depends upon the amount of clipping; the more clipping, the nearer the output approaches the triangular form.

The integrating network has the additional function of limiting signal amplitude in proportion to signal frequency. As the frequency increases, the amplitude is reduced in proportion.

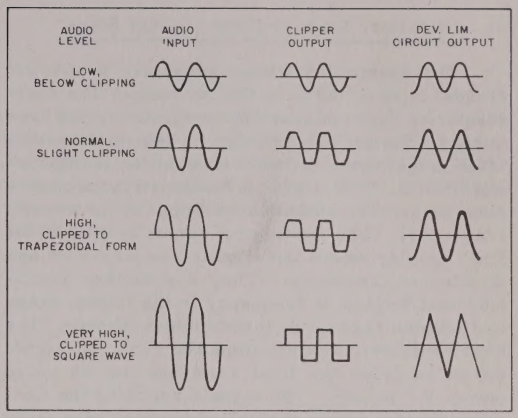


Figure 1.
Effect of Clipper and Integrator on Sine Waves of Different Amplitudes

The integrator output is amplified and applied to the IDC control, which limits the amplitude of the signals which reach the modulator. The IDC control limits deviation by controlling the maximum slope (or steepness) of the signal wavefront which reaches the modulator (see Fig. 2).

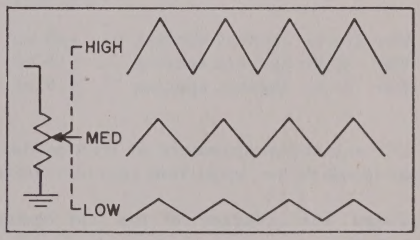


Figure 2.
How IDC Control Sets Steepness of Integrated Square Wave

In the incoming signal from the microphone, wavefront steepness depends upon both amplitude and frequency. The over-all effect of the IDC circuitry is to place a barrier upon the maximum wavefront steepness which can pass into the modulator. The slope of high amplitude signals is controlled by clipping and integrating the square waves which they produce. The slope of high frequency signals is limited to the allowable maximum by reducing the amplitude of these signals (Adjustment of the IDC control is covered in a subsequent paragraph of this instruction section).

c. Modulator Stage to Power Output Stage

The crystal oscillator generates a specific frequency in 2.083 to 4.500 mc range. The exact frequency depends upon the assigned carrier frequency. The oscillator output is sent to the modulator stage where the voice modulation is impressed upon it. This signal is combined in the modulator to provide a modulated output at the crystal frequency. The modulator output is sent to the first doubler where the signals are amplified and doubled in frequency. They are further amplified and tripled in frequency in the tripler stage and doubled once more in the doubler-driver. The doubler-driver stage develops the required signal power to drive the final amplifier to its rated output RF power. The signals reaching the final amplifier have been multiplied twelve times from the original frequency generated by the oscillator.

4. ADJUSTMENT OF THE IDC CONTROL

Correct setting of the IDC control is an important factor in the overall operation of the two-way radio communication system. The correct settings are as follows:

	Deviation
For 120 kc channel spacing . .	±15 kc
For 40 kc channel spacing . .	±15 kc
For 20 kc channel spacing . .	± 5 kc

The actual measurement of transmitter deviation involves two important considerations:

First: the accuracy of the test equipment being used.

Second: understanding the characteristics of the test equipment.

a. Test Equipment

In this text we shall use the MOTOROLA F4M-24B Series Frequency Monitor as the basic test instrument. This unit offers the degree of accuracy required for measurement of transmitter deviation.

b. Instrument Characteristics

In using the F4M-24B Series Frequency Monitor it is important to understand the action of the meter. The meter movement actually responds to average voltage. The meter scale, however, is calibrated in terms of peak voltage based on a sine wave signal. When the input waveform departs from a pure sine wave the meter reading does not indicate the true energy level of the signal. This energy level can be expressed as the ratio of average voltage to peak voltage of the incoming waveform. If this value is above the value for the sine wave, the meter reads high; if this value is below the sine wave value, the meter reads low.

c. Use of Oscilloscope

An oscilloscope can be used along with the frequency monitor to set the IDC control accurately. The oscilloscope is a highly reliable deviation indicator since it is instantaneous in action and the peak reading is unaffected by the waveform. It is strongly recommended that an oscilloscope be used wherever it is available. If no oscilloscope is available refer to the ALIGNMENT PROCEDURE CHART for setting of the IDC control by means of the frequency monitor alone.

Set up the equipment as described in the MEASUREMENT section of the frequency monitor manual. Connect the scope across the discriminator output as shown in Diagram 69B810633 in the frequency monitor manual. Modulate the transmitter with a 1000 cps tone connected across the microphone input terminals at the transmitter. Connect an AC VTVM across these terminals also.

Calibrate the 'scope as follows: Turn the IDC control to the full clockwise position. Adjust the tone modulation level for a reading of 10 kc. deviation on the monitor deviation meter. With a sine wave pattern on the screen use the vertical gain control to set the overall height to a convenient size, e.g., 10 full squares on the screen. This calibrates the 'scope for a reading of 1 square for each kc. deviation.

Increase the tone level to a minimum of one volt at the audio input terminals. Now turn the IDC control slowly counterclockwise until the height of the pattern represents the required transmitter deviation (15 kc. for 40 kc. or 120 kc. channel spacing, 5 kc. for 20 kc. channel spacing operation).

5. ALIGNMENT PROCEDURE

The transmitter is tuned and adjusted for its exact operating frequency prior to shipment from the factory. Unless damaged or abused in transit it should require no further adjustment before placing it in service, other than to align the final RF amplifier stage to the antenna. If alignment is required, refer to the alignment procedure in this section.

Any 0-50 microampere meter with an equivalent series resistance of 20000 ohms may be used as a metering device. The meter should be connected from chassis ground to the pin receptacle of the metering socket corresponding to the stage being measured. Refer to the schematic diagram for specific metering pin receptacle information.

FINAL METER READINGS

Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.

All readings given in the table below are minimum except PA, which is maximum. DO NOT exceed the value given for the PA current. This is the maximum plate current to which the unit can be safely tuned.

Readings 1 through 6 are purely relative and do not give actual current or voltage measurement.

When using the P-8500 or the P-8501 series test sets, position 7 is a d-c voltmeter with 1000 volts full scale. Actual B+ reading is obtained by multiplying the microampere scale reading by 20. The TU546 series test sets have a 0-1000 volt d-c scale from which the B+ is read directly.

When using the P-8500 or the P-8501 series test sets, position 8 indicates d-c relay control voltage when the transmitter is not keyed. Multiply the microampere scale reading by 0.3 to obtain the actual value of the d-c voltage. When using the TU546 series test sets, the relay control voltage is read directly with the position selector switch in position 10.

For all three series portable test sets, multiply the scale reading by 5 to obtain the actual PA plate current in milliamperes.

SWITCH POSITION	P-8500 & P-8501 SERIES	1	2	3	-4	5	6	7	8	PA(+4)
	TU546 SERIES	1	2	3	4	5	6	9	10	7
METER READING	30 WATTS	-	-	-	4	18	14	20	-	30
	50 WATTS	-	-	-	4	18	18	20	-	25

PRE-ALIGNMENT NOTES

EXCERPTS FROM FCC REGULATIONS

1. Radio transmitters may be tuned or adjusted only by duly authorized radio operators or by personnel working directly under their supervision.

2. The RF power output of a station shall be no more than required for satisfactory technical operation considering the area to be covered and the local conditions.

TEST EQUIPMENT REQUIRED

1. MOTOROLA Portable Test Set (P-8500 series, P-8501 series or TU546 series)
2. MOTOROLA K-9322 Alignment Tool Kit
3. MOTOROLA T1100A Series Frequency Monitor (for oscillator alignment and deviation adjustment)
4. RF wattmeter or dummy antenna
5. Power Supply (preferably the one designed for the transmitter under test)

HOW TO SET UP THE P-8500 SERIES AND THE P-8501 SERIES TEST SETS

1. Connect the dummy antenna or r-f wattmeter to the transmitter ANT. jack.
2. Connect the test set cable plug to the transmitter METER jack.
3. Place the test set REC. - XMTR. -0-50 UA switch in the XMTR. position.
4. Place the GRID CURRENT-METER-FIELD STRENGTH switch in the METER position.
5. Connect the power supply to the transmitter as shown on the intercabling diagram for the equipment.
6. If the power supply chassis has a HI-LO switch place it in the LO position.
7. Turn the equipment on. Allow 30 seconds for the tubes to warm up.

HOW TO SET UP THE TU546 SERIES TEST SET

1. Connect the dummy antenna or r-f wattmeter to the transmitter ANT. jack.
2. Connect one end of the metering cable to the test set and the other end to the transmitter METER receptacle.
3. Place the Function Selector Switch in the XMTR. position.
4. Place the oscillator and meter reversing switch in the OFF position.
5. Connect the power supply to the transmitter as shown on the intercabling diagram for the radio set.
6. Place the HI-LO switch on the power supply in the LO position.
7. Turn the equipment on. Allow 30 seconds for the tubes to warm up.

TEST SET SWITCH POSITIONS

P-8500 & P-8501 Series	1	2	3	-4	+4(PA)	5	6	7	8
TU546 Series	1	2	3	4	7	5	6	9	10
Circuit Metered	—	—	—	Tripler Grid	PA Plate Current	Doubler Driver Grid	PA Grid	PA Plate Voltage	Push-to-Talk

HOW TO KEY THE TRANSMITTER

1. Use the XMTR-ON switch of the test set to place the unmodulated carrier on the air for meter reading and adjustment.

2. Use the MOTOROLA TU353A Microphone (or equivalent) to key the transmitter and modulate the carrier as required.

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Plate current is excessive in untuned stages and may damage the unit. Turn the transmitter on for brief periods while reading the meter and making the adjustments.

FREQUENCY CALCULATIONS

$f_o = \frac{f_c}{12}$ where: f_o = crystal frequency, and f_c = carrier frequency

IDC CONTROL SETTING

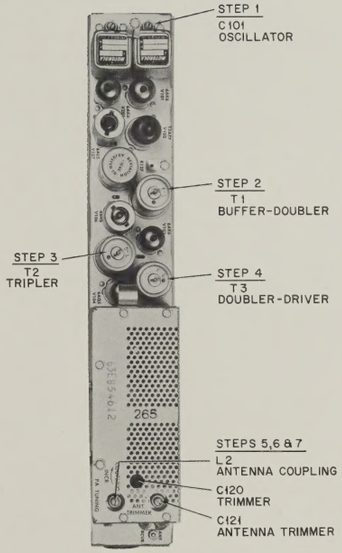
1. Set up T1100A Series Frequency Monitor for voice modulation measurement. (If an oscilloscope is available see text for IDC setting using the scope.)

2. Turn transmitter on and modulate with 1000 cps tone.

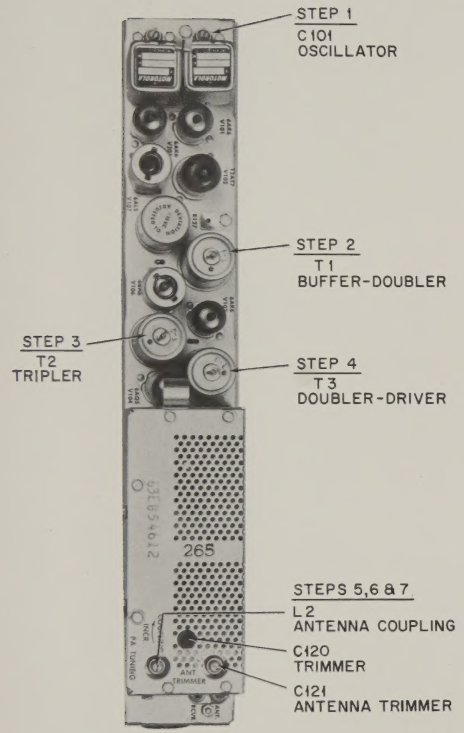
3. Adjust the IDC control (R127) on the transmitter chassis until the MODULATION DEVIATION meter on the station monitor reads as outlined in the following paragraphs.

   (a) When the transmitter is intended for operation on a 40 kc or 120 kc channel spacing, the IDC control should be adjusted for an approximate 17 kc reading on the station monitor MODULATION DEVIATION METER. Note that the MODULATION DEVIATION METER reads average voltage but is calibrated in peak voltage. The setting of 17 kc corresponds to a peak of 15 kc.

   (b) When the transmitter is intended for operation on a 20 kc channel spacing, the IDC control should be adjusted for an approximate 5-1/2 kc reading on the station monitor MODULATION DEVIATION METER.



STEP	SWITCH POS. TU546 TEST SET	ADJUSTMENT	METER READING	STAGE, CONDITIONS AND PROCEDURE
1		C101	Maximum On-frequency	OSCILLATOR. Place the HI-LO switch in the LO position. Adjust only when primary or secondary frequency standard is available (MOTOROLA T1100A Series may be used). Set up frequency monitor. Loosen locknut, adjust C101 for "on-frequency" reading on monitor. Tighten locknut.
2	4	T1	Maximum	BUFFER-DOUBLER. Adjust primary slug from bottom. Adjust secondary slug from top. The circuit frequency is two times the crystal frequency.
3	5	T2	Maximum	TRIPLER. Adjust primary slug from bottom. Adjust secondary slug from top. The circuit frequency is six times the crystal frequency. Repeak T1 with the meter switch in position 4.
4	6	T3	Maximum	DOUBLER-DRIVER. Adjust primary slug from bottom. Adjust secondary slug from top. Tune for a definite peak. The meter will always show the fixed bias in this position. A definite peak reading indicates proper alignment. The circuit frequency is twelve times the crystal frequency.
5	7	C120, C121	Minimum (Dip)	POWER AMPLIFIER. Loosen locknuts on C120 and C121. Set ANT. TRIMMER C121 for minimum plate current. Turn COUPLING adjustment (L2) fully counterclockwise (decoupled). Tune C120 for a dip. Set power supply HI-LO switch to HI.
6	7	C121	Maximum	ANTENNA INPUT. Adjust ANT. TRIMMER C121 for maximum meter reading.
7	7	C120, C121, L2	Maximum RF Output NOTE DO NOT EXCEED 150 ma	ANTENNA COUPLING. Remove test load and connect antenna. 1. Using field strength meter: Make adjustments with transmitter shielded as much as possible by housing. Place RF probe near antenna. Adjust C121 and COUPLING (L2) for maximum RF indication on meter. Do not exceed 150 ma. 2. Without field strength meter: Turn COUPLING (L2) counterclockwise, increasing gradually while retuning C120 for dip. Increase coupling until only a slight dip is apparent. DO NOT overcouple. This causes the dip to disappear and reduces power output. Recheck setting of C121. DO NOT EXCEED 150 ma. Repeak T1, T2 and T3. Tighten locknuts on C120 and C121.



STEP	SWITCH POS. TU546 TEST SET	ADJUSTMENT	METER READING	STAGE, CONDITIONS AND PROCEDURE
1		C101	Maximum On-frequency	OSCILLATOR. Place the HI-LO switch in the LO position. Adjust only when primary or secondary frequency standard is available (MOTOROLA T1100A Series may be used). Set up frequency monitor. Loosen locknut, adjust C101 for "on-frequency" reading on monitor. Tighten locknut.
2	4	T1	Maximum	BUFFER-DOUBLER. Adjust primary slug from bottom. Adjust secondary slug from top. The circuit frequency is two times the crystal frequency.
3	5	T2	Maximum	TRIPLER. Adjust primary slug from bottom. Adjust secondary slug from top. The circuit frequency is six times the crystal frequency. Repeak T1 with the meter switch in position 4.
4	6	T3	Maximum	DOUBLER-DRIVER. Adjust primary slug from bottom. Adjust secondary slug from top. Tune for a definite peak. The meter will always show the fixed bias in this position. A definite peak reading indicates proper alignment. The circuit frequency is twelve times the crystal frequency.
5	7	C120, C121	Minimum (Dip)	POWER AMPLIFIER. Loosen locknuts on C120 and C121. Set ANT. TRIMMER C121 for minimum plate current. Turn COUPLING adjustment (L2) fully counterclockwise (decoupled). Tune C120 for a dip. Set power supply HI-LO switch to HI.
6	7	C121	Maximum	ANTENNA INPUT. Adjust ANT. TRIMMER C121 for maximum meter reading.
7	7	C120, C121, L2	Maximum RF Output NOTE DO NOT EXCEED 150 ma	ANTENNA COUPLING. Remove test load and connect antenna. 1. Using field strength meter: Make adjustments with transmitter shielded as much as possible by housing. Place RF probe near antenna. Adjust C121 and COUPLING (L2) for maximum RF indication on meter. Do not exceed 150 ma. 2. Without field strength meter: Turn COUPLING (L2) counterclockwise, increasing gradually while retuning C120 for dip. Increase coupling until only a slight dip is apparent. DO NOT overcouple. This causes the dip to disappear and reduces power output. Recheck setting of C121. DO NOT EXCEED 150 ma. Repeak T1, T2 and T3. Tighten locknuts on C120 and C121.

FINAL METER READINGS

Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.

All readings given in the table below are minimum except PA, which is maximum. DO NOT exceed the value given for the PA current. This is the maximum plate current to which the unit can be safely tuned.

Readings 1 through 6 are purely relative and do not give actual current or voltage measurement.

When using the P-8500 or the P-8501 series test sets, position 7 is a d-c voltmeter with 1000 volts full scale. Actual B+ reading is obtained by multiplying the microampere scale reading by 20. The TU546 series test sets have a 0-1000 volt d-c scale from which the B+ is read directly.

When using the P-8500 or the P-8501 series test sets, position 8 indicates d-c relay control voltage when the transmitter is not keyed. Multiply the microampere scale reading by 0.3 to obtain the actual value of the d-c voltage. When using the TU546 series test sets, the relay control voltage is read directly with the position selector switch in position 10.

For all three series portable test sets, multiply the scale reading by 5 to obtain the actual PA plate current in milliamperes.

SWITCH POSITION	P-8500 & P-8501 SERIES	1	2	3	-4	5	6	7	8	PA(+4)
	TU546 SERIES	1	2	3	4	5	6	9	10	7
METER READING	30 WATTS	-	-	-	4	18	14	20	-	30
	50 WATTS	-	-	-	4	18	18	20	-	25

41A85084
CRYSTAL CLAM

Y201 (2-FREQ

V2C

26K89003
TUBE SHIEL

YED IN OHMS AND ARE ±10% 1/2 WATT
DOO OHMS.

V10 MICROMICROFARADS UNLESS OTHERWISE

POSITION 1 AS SHIPPED FROM THE FACTORY.
ER AUDIO SENSITIVITY IS REQUIRED. REFER TO
FOR FURTHER DETAILS.

26A89003
TUBE SHIEL THODE CIRCUIT USED ONLY ON SINGLE

IES COMPONENTS ARE INCORPORATED ON

V10 TWO-FREQ. UNITS (REFERENCED C207)
EQ. UNITS (REFERENCED C105).

EMPLOYED FOR THE HH FREQUENCY RANGE.
T DETAILS APPLICABLE TO THIS FILTER.
RTS LIST FOR THE SPECIFIC IDENTIFICATION
ARMONIC FILTERS.

T ATION. REFER TO TK419ML COIL KIT PARTS
TRIPLE

EUTRALIZING CAPACITY INHERENT IN CIRCUIT.

V10 HL KIT PARTS LIST FOR COMPONENT

TS)
TS)

ATTS)
ATTS)

75 VOLTS

15B83040
SHIELD COVE ATIONS AND 200 FOR 30-54 MC APPLICATIONS.
LICATIONS. AND 100K FOR 40-54MC. APPLICATIONS.
R133 (120Ω) IS REMOVED AND REPLACED WITH

C12
TRIMME

V & R
NOTES:

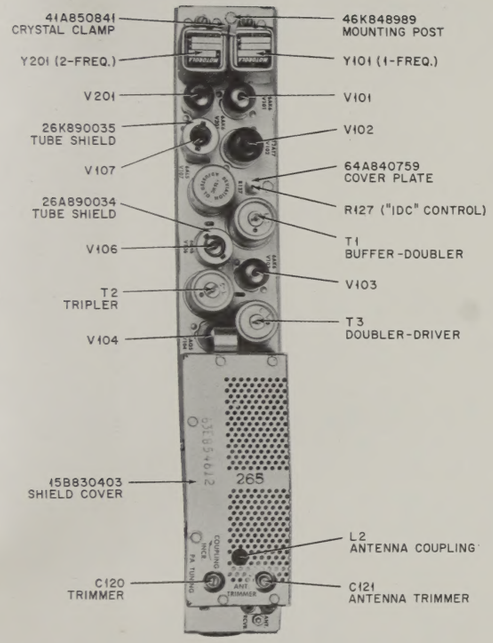
30. VOLTAGE AND RESISTANCE READINGS ARE NOMINAL VALUES AND MAY VARY ±20%.
31. ALL VOLTAGE AND RESISTANCE READINGS ARE TAKEN WITH RESPECT TO GROUND MEASUREMENTS TO BE MADE WITH A VTVM.
32. V201 IS EMPLOYED ON 2-FREQUENCY MODELS ONLY.
33. READINGS TAKEN WITH A 1 MEG RESISTOR IN SERIES WITH METER LEAD.
34. MICROPHONE IN CIRCUIT.
35. VOLTAGE READINGS FOR V101 & V102 ARE TAKEN WITH FREQUENCY SWITCH IN APPLICABLE POSITION ON 2 FREQUENCY UNITS.
36. THIS READING IS 100V FOR 40-54 MC OPERATION OR 150V FOR 25-40 MC OPERATION.
37. THIS READING IS 25V FOR 40-54 MC OPERATION OR 36V FOR 25-40MC OPERATION *THE TRANSMITTER IS CONNECTED TO THE POWER SUPPLY WHILE READINGS ARE TAKEN.*
38. ALL TUBES IN SOCKETS AND METERING TEST SET NOT CONNECTED.
39. NO FILAMENT VOLTAGE APPLIED TO UNIT AND NEGATIVE PROBE OF OHMMETER CONNECTED TO GROUND.
40. THIS READING WILL VARY WITH ADJUSTMENT OF R127.
41. MICROPHONE NOT IN CIRCUIT.
42. AN INITIAL LOW READING MAY BE OBTAINED AT MANY POINTS DUE TO THE CHARGING OF CAPACITORS IN THE POWER SUPPLY. ALLOW CAPACITORS TO CHARGE TO OBTAIN FULL READINGS.
43. 13 OHMS FOR 1 AND 2 FREQUENCY OPERATION WITH FREQUENCY SWITCH IN APPLICABLE POSITION.
44. THIS READING IS 420K FOR 40-54 MC OPERATION OR 300K FOR 25-40MC OPERATION

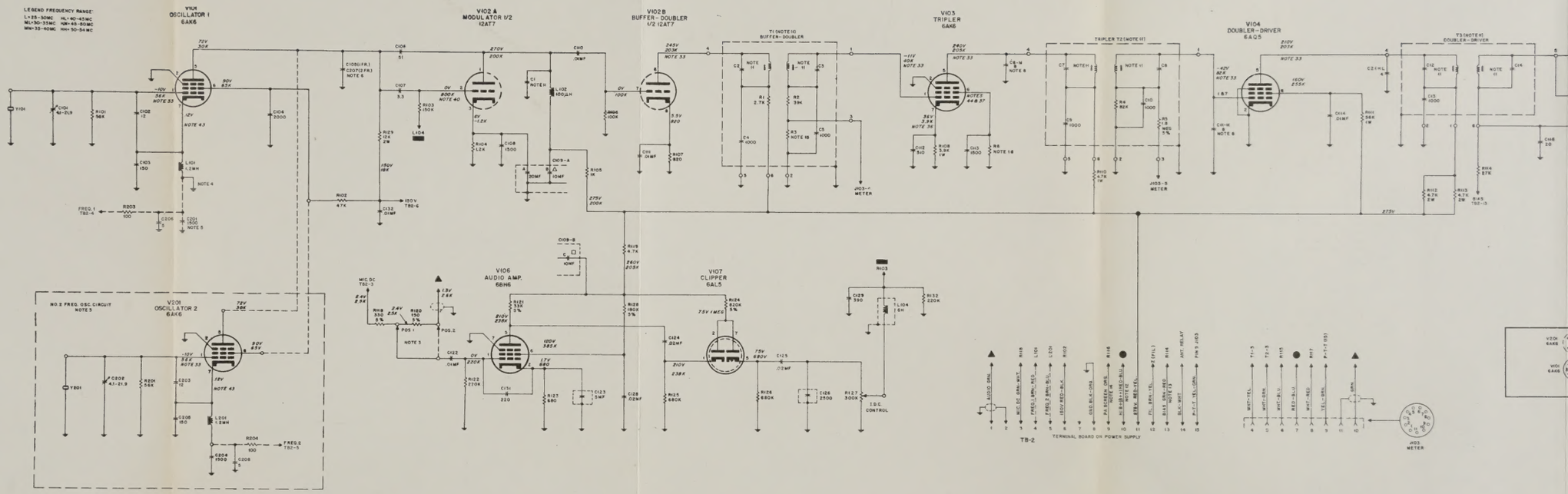
MODEL TABLE

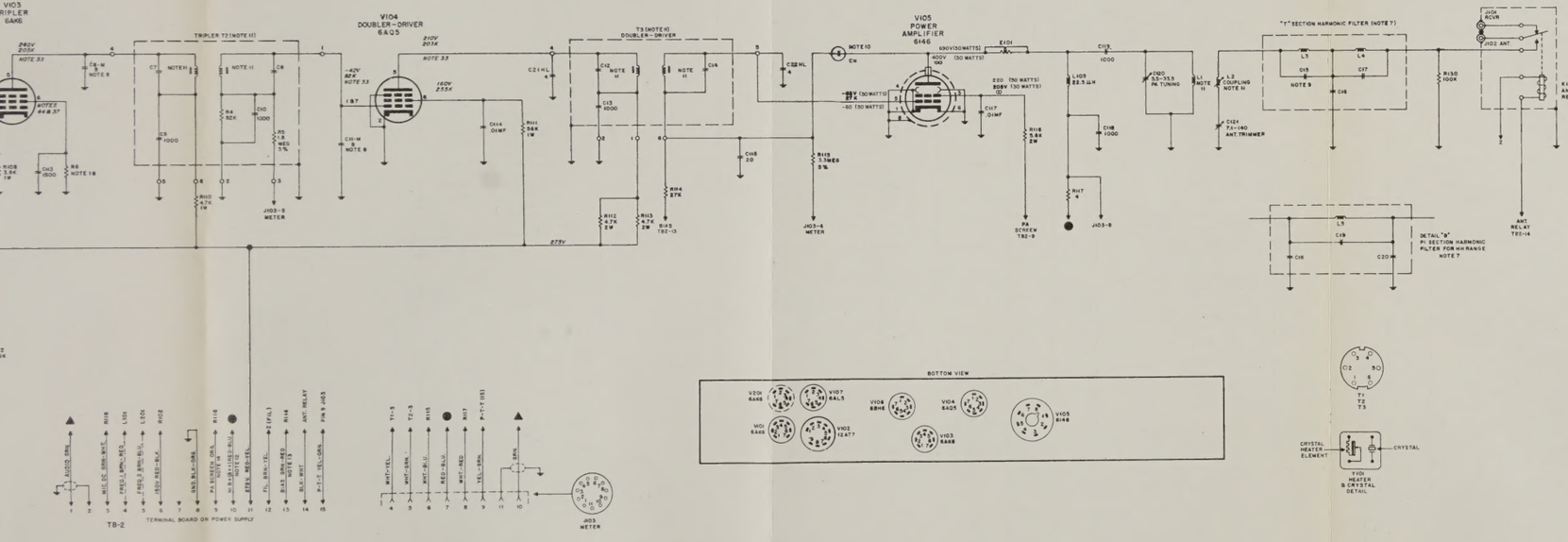
ONE FREQUENCY	SUFFIX	TWO FREQUENCY	SUFFIX	FREQUENCY RANGE
TTB1031AA / TA234L	1	TTB1031AB / TA234-C2L	2	25-30MC
TTB1032AA / TA234ML	1	TTB1032AB / TA234-C2ML	2	30-35MC
TTB1033AA / TA234MM	1	TTB1033AB / TA234-C2MM	2	35-40MC
TTB1034AA / TA234HL	1	TTB1034AB / TA234-C2HL	2	40-45MC
TTB1035AA / TA234HM	1	TTB1035AB / TA234-C2HM	2	45-50MC
TTB1036AA / TA234HH	1	TTB1036AB / TA234-C2HH	2	50-54MC

AEPD-2776-O

Models TTB1030AA/TA234 and
TTB1030AB/TA234-C2 Transmitters
Schematic Diagram
Motorola No. 63E854612-E
11/5/59-RCS


41A850841
CRYSTAL CLAMP
Y201 (2-FREQ.)
V201
26K890035
TUBE SHIELD
V107
26A890034
TUBE SHIELD
V106
T2
TRIPLER
V104
15B830403
SHIELD COVER
C120
TRIMMER
46K848989
MOUNTING POST
Y101 (1-FREQ.)
V101
V102
64A840759
COVER PLATE
R127 ("IDC" CONTROL)
T1
BUFFER-DOUBLER
V103
T3
DOUBLER-DRIVER
L2
ANTENNA COUPLING
C121
ANTENNA TRIMMER


LEGEND FREQUENCY RANGE:
LX=25-50MC HL=40-45MC
ML=30-33MC MM=45-50MC
MM=35-40MC HH=50-54MC
V101 OSCILLATOR 1 6AK6
V102 A MODULATOR 1/2 12AT7
V102B BUFFER-DOUBLER 1/2 12AT7
V103 TRIPLER 6AN8
V104 DOUBLER-DRIVER 6AQ5
T1 (NOTE H) BUFFER-DOUBLER
TRIPLER T2 (NOTE H)
T3 (NOTE H) DOUBLER-DRIVER
NO. 2 FREQ. OSC. CIRCUIT NOTE 5
V201 OSCILLATOR 2 6AK6
V106 AUDIO AMP. 6BH6
V107 CLIPPER 6AL5
MIC DC TB2-3
POS. 1
POS. 2
NOTE 3
FREQ. 1 TB2-4
FREQ. 2 TB2-5
150V TB2-6
IDC CONTROL
METER
TERMINAL BOARD ON POWER SUPPLY
TB-2



SCHEMATIC NOTES:

1. ALL RESISTOR VALUES ARE INDICATED IN OHMS AND ARE ±10% 1/2 WATT UNLESS OTHERWISE STATED. K=1000 OHMS.
2. ALL CAPACITOR VALUES ARE IN MICROMICROFARADS UNLESS OTHERWISE STATED.
3. CAPACITOR C102 IS CONNECTED TO POSITION 1 AS SHIPPED FROM THE FACTORY. CONNECT TO POSITION 2 IF GREATER AUDIO SENSITIVITY IS REQUIRED. REFER TO THE TRANSMITTER INSTRUCTIONS FOR FURTHER DETAILS.
4. GROUND CONNECTION IN V104 CATHODE CIRCUIT USED ONLY ON SINGLE FREQUENCY MODELS.
5. DASHED CIRCUITRY AND 200 SERIES COMPONENTS ARE INCORPORATED ON TWO-FREQUENCY MODELS ONLY.
6. CAPACITOR NOTED (3 #) IS 47MMF FOR TWO-FREQ. UNITS (REFERENCED C207) AND IS 20 MMF. FOR SINGLE-FREQ. UNITS (REFERENCED C103).
7. A UNIQUE PI SECTION FILTER IS EMPLOYED FOR THE HH FREQUENCY RANGE. REFER TO DETAIL "A" FOR CIRCUIT DETAILS APPLICABLE TO THIS FILTER. REFER TO THE TK419 COIL KIT PARTS LIST FOR THE SPECIFIC IDENTIFICATION OF COMPONENTS USED IN THE HARMONIC FILTERS.
8. USED ONLY FOR 30-35 MC. OPERATION. REFER TO TK419ML COIL KIT PARTS LIST.
9. C45 IS NOT USED ON TK419ML.
10. (+) THIS SYMBOL INDICATES NEUTRALIZING CAPACITY INHERENT IN CIRCUIT.
11. REFER TO THE TK419 SERIES COIL KIT PARTS LIST FOR COMPONENT IDENTIFICATION.
12. HI B+(B+++): 400 VOLTS (30 WATTS)
    705 VOLTS (50 WATTS)
13. BIAS VOLTAGE: -23 VOLTS (30 WATTS)
    -36 VOLTS (50 WATTS)
14. PA SCREEN SOURCE VOLTAGE: 275 VOLTS
15. R3 IS 680 FOR 25-50 MC APPLICATIONS AND 220 FOR 30-54 MC APPLICATIONS.
16. R6 IS 220K FOR 25-40 MC APPLICATIONS AND 100K FOR 40-54 MC APPLICATIONS.
17. ON TWO-FREQUENCY MODELS, R133 (100Ω) IS REMOVED AND REPLACED WITH R202 (56Ω).

V.S.R. NOTES:

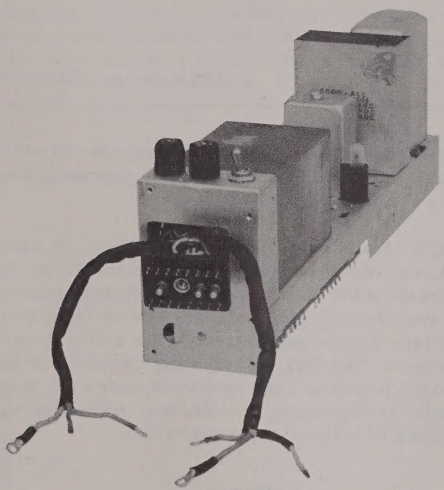
30. VOLTAGE AND RESISTANCE READINGS ARE NOMINAL VALUES AND MAY VARY ±20%.
31. ALL VOLTAGE AND RESISTANCE READINGS ARE TAKEN WITH RESPECT TO GROUND. MEASUREMENTS TO BE MADE WITH A VTVM.
32. V201 IS EMPLOYED ON 2-FREQUENCY MODELS ONLY.
33. READINGS TAKEN WITH A 1 MEG RESISTOR IN SERIES WITH METER LEAD.
34. MICROPHONE IN CIRCUIT.
35. VOLTAGE READINGS FOR V101 & V102 ARE TAKEN WITH FREQUENCY SWITCH IN APPLICABLE POSITION ON 2 FREQUENCY UNITS.
36. THIS READING IS 100V FOR 40-54 MC OPERATION OR 190V FOR 25-40 MC OPERATION.
37. THIS READING IS 25V FOR 40-54 MC OPERATION OR 36V FOR 25-40MC OPERATION *THE TRANSMITTER IS CONNECTED TO THE POWER SUPPLY WHILE READINGS ARE TAKEN.*
38. ALL TUBES IN SOCKETS AND METERING TEST SET NOT CONNECTED.
39. NO FILAMENT VOLTAGE APPLIED TO UNIT AND NEGATIVE PROBE OF OHMMETER CONNECTED TO GROUND.
40. THIS READING WILL VARY WITH ADJUSTMENT OF R127.
41. MICROPHONE NOT IN CIRCUIT.
42. AN INITIAL LOW READING MAY BE OBTAINED AS MANY POINTS DUE TO THE CHARGING OF CAPACITORS IN THE POWER SUPPLY. ALLOW CAPACITORS TO CHARGE TO OBTAIN FULL READINGS.
43. ±3 OHMS FOR 1 AND 2 FREQUENCY OPERATION WITH FREQUENCY SWITCH IN APPLICABLE POSITION.
44. THIS READING IS 420K FOR 40-54 MC OPERATION OR 300K FOR 25-40MC OPERATION

MODEL TABLE

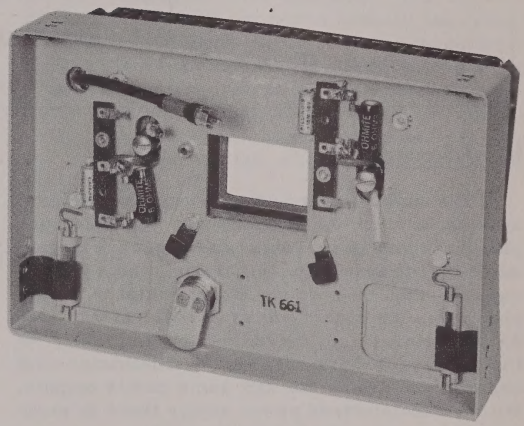
ONE FREQUENCY	SUFFIX	TWO FREQUENCY	SUFFIX	FREQUENCY RANGE
TTB1030AA / TA234L	1	TTB1030AB / TA234-C2L	2	25-30 MC
TTB1032AA / TA234ML	1	TTB1032AB / TA234-C2ML	2	30-35 MC
TTB1033AA / TA234MN	1	TTB1033AB / TA234-C2MN	2	35-40 MC
TTB1034AA / TA234NL	1	TTB1034AB / TA234-C2NL	2	40-45 MC
TTB1035AA / TA234NM	1	TTB1035AB / TA234-C2NM	2	45-50 MC
TTB1036AA / TA234NN	1	TTB1036AB / TA234-C2NN	2	50-54 MC

Models TTB1030AA/TA234 and
TTB1030AB/TA234-C2 Transmitters
Schematic Diagram
Motorola No. 63E854612-E
11/5/59-RCS

TRANSISTORIZED POWER SUPPLY



TU588
POWER SUPPLY



TRANSISTORS AND POWER SUPPLY
COMPONENTS
ON RADIO SET FRONT PANEL

1. INTRODUCTION

The TU588 is a fully transistorized power supply with a common emitter circuit. It provides all the plate, screen and bias voltages required by the mobile radio transmitter and receiver. The transistorized circuitry replaces the vibrator circuits commonly used in mobile radio applications.

a. Basic Principle

The transistor circuit of the power supply is essentially a single-pole, double-throw switch, operating back and forth continuously. This switching action interrupts the flow of battery current through the power supply transformer primary. Interrupting the d-c gives the effect of a-c and the transformer windings step up the voltages as required for the rectified outputs.

The input is connected to the transistor emitters. The opposite ends of the transformer are connected to the transistor collectors, which alternately open and close the circuit to the d-c input. The current flows first through one transistor, then through the other, giving the effect of an alternating current. This circuit effectively duplicates the action of a vibrator and is used to replace the vibrator circuit.

MOTOROLA INC. COMMUNICATIONS DIVISION
Engineering Publications 4501 W. Augusta Blvd. Chicago 51, Illinois

SCHEMATIC DIAGRAM PARTS LIST

Reference:
Schematic Diagram
63E854612-E

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C1L	21K813512	ceramic; rectangular; 68 uuf ±10%; 450 vdcw
C1ML		same as C1L
C1MM	21K2733	molded silver mica; 30 uuf ±10%; 500 vdcw
C1HL	21K2768	molded silver mica; 20 uuf ±10%; 500 vdcw
C1HM	21R38223	ceramic; tubular; 10 uuf ±5%; 500 vdcw
C1HH		NOT USED
C2L	21R482328	ceramic; tubular; 30 uuf ±5%; 500 vdcw
C2ML	21K86392	ceramic; tubular; 16 uuf ±. 75 uuf 500 vdcw
C2MM		same as C2ML
C2HL	21R470324	ceramic; tubular; 6 uuf ±1 uuf; 500 vdcw
C2HM		same as C2HL
C2HH		NOT USED
C3L		same as C2L
C3ML		same as C2ML
C3MM		same as C2ML
C3HL		same as C2HL
C3HM		same as C2HL
C3HH		NOT USED
C4	21K6638	molded mica; 1000 uuf ±20%; 300 vdcw
C5		same as C4
C6L		NOT USED
C6ML	21R892897	ceramic; tubular; 8 uuf ±. 5 uuf; 500 vdcw
C6MM		NOT USED
C6HL		NOT USED
C6HM		NOT USED
C6HH		NOT USED
C7L		same as C6ML
C7ML		NOT USED
C7MM		NOT USED
C7HL	21K2753	molded silver mica; 3, 3 uuf ±. 5 uuf; 500 vdcw
C7HM		same as C7HL
C7HH		NOT USED
C8L	21R891167	ceramic; tubular; 12 uuf ±5%; 500 vdcw
C8ML		NOT USED
C8MM		NOT USED
C8HL		same as C7HL
C8HM		same as C7HL
C8HH		NOT USED
C9		same as C4
C10		same as C4
C11L		NOT USED
C11ML		same as C6ML
C11MM		NOT USED
C11HL		NOT USED
C11HM		NOT USED
C11HH		NOT USED
C12L		same as C2ML
C12ML		NOT USED
C12MM		NOT USED
C12HL		NOT USED
C12HM		NOT USED
C12HH		NOT USED
C13		same as C4
C14L		same as C1HM
C14ML		NOT USED
C14MM		NOT USED
C14HL		NOT USED
C14HM		NOT USED

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C14HH		NOT USED
C15L	21K474952	ceramic; tubular; 4 uuf ±. 5 uuf; 500 vdcw
C15ML	21A478274	molded; tubular; 2. 2 uuf ±20%; 500 vdcw
C15MM		same as C15ML
C15HL		NOT USED
C15HM		same as C15L
C15HH		NOT USED
C16L	21K410062	molded silver mica; 170 uuf ±5%; 500 vdcw
C16ML	21R6506	molded silver mica; 150 uuf ±5%; 500 vdcw
C16MM	21K410061	molded silver mica; 130 uuf ±5%; 500 vdcw
C16HL	21K410060	molded silver mica; 110 uuf ±5%; 500 vdcw
C16HM		same as C16HL
C16HH		NOT USED
C17L	21R38932	ceramic; tubular; 24 uuf ±5%; 500 vdcw
C17ML	21R474330	ceramic; tubular; 20 uuf ±5%; 500 vdcw
C17MM		same as C17L
C17HL		same as C17ML
C17HM		same as C17ML
C17HH		NOT USED
C18L		NOT USED
C18ML		NOT USED
C18MM		NOT USED
C18HL		NOT USED
C18HM		NOT USED
C18HH	21K803488	molded silver mica; 40 uuf ±3%; 500 vdcw
C19L		NOT USED
C19ML		NOT USED
C19MM		NOT USED
C19HL		NOT USED
C19HM		NOT USED
C19HH		same as C8L
C20L		NOT USED
C20ML		NOT USED
C20MM		NOT USED
C20HL		NOT USED
C20HM		NOT USED
C20HH		same as C18HH
C21L		NOT USED
C21ML		NOT USED
C21MM		NOT USED
C21HL		same as C15L
C21HM		NOT USED
C21HH		NOT USED
C22L		NOT USED
C22ML		NOT USED
C22MM		NOT USED
C22HL		same as C15L
C22HM		NOT USED
C22HH		NOT USED
C101	19A830230	variable: air; 4. 1 uuf min. -21. 9 uuf max.
C102		same as C8L
C103	21K840047	dipped silver mica; 150 uuf ±5%; 500 vdcw
C104	21K837746	ceramic; disc; 2000 uuf ±10%; 500 vdcw
C105	21K2768	molded silver mica; 20 uuf ±10%; 500 vdcw; used only in 1-freq. model; replace with C207 in 2-freq. model
C106	21R83198	ceramic; tubular; 51 uuf ±5%; 500 vdcw
C107		same as C7HL
C108	21B800801	ceramic; disc; . 0015 uf GMV +100% max; 500 vdcw

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed: unless otherwise stated
C109	23K892117	electrolytic; tubular; 3 section; consisting of:
C109A		20 uf +100-10%; 25 vdcw; section
C109B		△ 10 uf +50-10%; 450 vdcw; section
C109C		□ 10 uf +50-10%; 450 vdcw; section
C110	21A801139	ceramic; disc; . 01 uf +80-20%; 600 vdcw
C111		same as C110
C112	21K845214	dipped silver mica; 510 uuf ±5%; 300 vdcw
C113		same as C108
C114		same as C110
C115		same as C105
C116		same as C110
C117		same as C110
C118	21K2727	molded mica; 1000 uuf ±20%; 2000 vdcw
C119		same as C118
C120	19B830246	variable: air; 5. 5 uuf min. -33. 5 uuf max.
C121	19A830291	variable: air; 7. 1 uuf min. -140 uuf max.
C122		same as C110
C123	23K890624	electrolytic; tubular; 1 section; 5 uf +100-15%; 150 vdcw
C124	21B401029	ceramic; disc; . 02 uf +80-20%; 600 vdcw
C125		same as C124
C126	8K836753	oil filled; tubular; . 0025 uf ±10% 100 vdcw
C127		NOT USED
C128		same as C124
C129	21K6720	molded silver mica; 390 uuf ±5% 500 vdcw
C130		same as C110
C131	21R410115	ceramic; disc; 220 uuf ±20%; 500 vdcw
C132		same as C110
C201		same as C108
C202		same as C101
C203		same as C8L
C204		same as C108
C205		same as C103
C206	23K857384	electrolytic; tubular; 5 uf +100-10%; 50 vdcw
C207	21R41867	ceramic; tubular; 15 uuf ±5%; 500 vdcw; replaces C105 (20 uuf) in One-Freq. Operation
C208		same as C206
		SUPPRESSOR,
E101	6A832263	parasitic
		CONNECTORS,
J101	9A87120	receptacle: female; single contact; round molded mica filled phenolic base; chassis mounted; RECEIVER
J102		same as J101 except connects to ANTENNA
J103	9A880881	receptacle: female; 11 contact; polarized; round molded black phenolic base; saddle mounting; METER
		RELAY,
K101	59K854405	Armature: non-coaxial; contact arrangement; 1 form "C"
		COIL,
L1L	24K832226	RF: tank; 7-1/2 turns
L1ML	24K832077	RF: tank; 5-1/2 turns

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		COIL,
L1MM		same as L1ML
L1HL	24A832225	RF: tank; 3-1/2 turns
L1HM		same as L1HL
L1HH		same as L1HL
L2L	24K832476	RF: output coupling; 4-1/2 turns
L2ML	24K832249	RF: output coupling; 3-1/2 turns
L2MM		same as L2ML
L2HL	24A830195	RF: output coupling; 2-1/2 turns
L2HM		same as L2HL
L2HH	24A832875	RF: output coupling; 3-1/2 turns
L3L	24K810403	RF: harmonic filter; 8 turns
L3ML	24K810402	RF: harmonic filter; 7 turns
L3MM	24K810401	RF: harmonic filter; 6 turns
L3HL	24B810400	RF: harmonic filter; 5 turns
L3HM	24K832224	RF: harmonic filter; 4 turns
L3HH		NOT USED
L4L		same as L3L
L4ML		same as L3ML
L4MM		same as L3MM
L4HL		same as L3HL
L4HM		same as L3HM
L4HH		NOT USED
L5L		NOT USED
L5ML		NOT USED
L5MM		NOT USED
L5HL		NOT USED
L5HM		NOT USED
L5HH		same as L3ML
L101	24A800899	RF: choke; 1.2 millihenries
L102	24A832402	RF: choke; 100 microhenries
L103	24A812542	RF: choke; 22.5 microhenries
L104	25D850636	AF: choke; 6 henries
L201		same as L101
		RESISTOR, fixed: carbon; unless otherwise stated
R1	6R5577	2. 7K ±10%; 1/2 w; ins.
R2	6R6487	37K ±10%; 1/2 w; ins.
R3L	6R5651	680 ohm ±5%; 1/2 w; ins.
R3ML	6R6166	1. 2K ±5%; 1/2 w; ins.
R3MM		same as R3ML
R3HL		same as R3ML
R3HM		same as R3ML
R3HH		same as R3ML
R4	6R5644	82,000 ohm ±10%; 1/2 w; ins.
R5	6R401017	1. 8 megohm ±5%; 1/2 w; ins.
R6L	6R6407	220K ±10%; 1/2 w; ins.
R6ML		same as R6L
R6MM		same as R6L
R6HL	6R6031	100K ±10%; 1/2 w; ins.
R6HM		same as R6HL
R6HH		same as R6HL
R101	6R6378	56K ±10%; 1/2 w; ins.
R102	6R6048	47K ±10%; 1/2 w; ins.
R103	6R6398	150K ±10%; 1/2 w; ins.
R104	6R6393	1. 2K ±10%; 1/2 w; ins.
R105	6R6229	1K ±10%; 1/2 w; ins.
R106		same as R6HL
R107	6R6269	820 ohm ±10%; 1/2 w; ins.
R108	6R5618	3. 9K ±10%; 1 w; ins.
R109		NOT USED
R110	6R5576	4. 7K ±10%; 1 w; ins.
R111	6R6402	56K ±10%; 1 w; ins.
R112	6R5671	4. 7K ±10%; 2 w; ins.
R113		same as R112
R114	6R6434	27K ±10%; 1/2 w; ins.
R115	6R488185	3. 3 megohm ±5%; 1/2 w; ins.
R116	6R5765	5. 6K ±10%; 2 w; ins.
R117	17K892469	wire wound; 4 ohm ±2%; 1 w; ins
or	17B821901	wire wound; 4 ohm ±2%; 3 w; ins
R118	6R120638	330 ohm ±5%; 1/2 w; ins.
R119	6R6080	4. 7K ±10%; 1/2 w; ins.
R120	6R5645	150 ohm ±5%; 1/2 w; ins.

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		RESISTOR, fixed: carbon; unless otherwise stated
R121	6R2068	33K ±5%; 1/2 w; ins.
R122		same as R6L
R123	6R6040	680 ohm ±10%; 1/2 w; ins.
R124	6R5773	820K ±5%; 1/2 w; ins.
R125	6R6475	680K ±10%; 1/2 w; ins.
R126		same as R125
R127	18K812998	variable: 300K ±20%; 1/4 w
R128	6R2061	180K ±5%; 1/2 w; ins.
R129	6R5766	12K ±10%; 2 w; ins.
R130		same as R6HL
R131		same as R6HL
R132		same as R6L
R133	6R488021	120 ohm ±10%; 1 w; ins.
R201		same as R101
R202	6R488090	56 ohm ±10%; 2 w; ins.
R203	6R6326	100 ohm ±10%; 1/2 w; ins.
R204		same as RZ03
		TRANSFORMER,
T1L	24K832479	RF: Buffer-Doubler; base stamped 479; includes two 46K821425 CORE, adjustable tuning and C2L, C3L, C4, C5, R1, R2, R3L
T1ML	24B832071	RF: Buffer-Doubler; base stamped 071; includes two 46K821425 CORE, adjustable tuning and C2ML, C3ML, C4, C5, R1, R2, R3ML
T1MM		same as T1ML except includes C2MM, C3MM, C4, C5, R1, R2, R3MM
T1HL	24B832211	RF: Buffer- Doubler; base stamped 211; includes two 46K821425 CORE, adjustable tuning and C2HL, C3HL, C4, C5
T1HM		same as T1HL except includes C2HM, C3HM, C4, C5, R1, R2, R3HM
T1HH	24K832458	RF: Buffer- Doubler; base stamped 458; includes two 46K821425 CORE adjustable tuning and C4, C5, R1, R2, R3HH
T2L	24K832478	RF: Tripler; base stamped 478; includes two 46K821425 CORE adjustable tuning and C7L, C8L, C9, C10, R4, R5
T2ML	24B832073	RF: Tripler; base stamped 073; includes two 46K821425 CORE adjustable tuning and C9, C10, R4, R5
T2MM		same as T2ML
T2HL	24B832212	RF: Tripler; base stamped 212, includes two 46K821425 CORE adjustable tuning and C7HL, C8HL, C9, C10, R4, R5
T2HM		same as T2HL except includes C7HM, C8HM, C9, C10, R4, R5
T2HH	24K832459	RF: Tripler; base stamped 459; includes two 46K821425 CORE adjustable tuning and C9, C10 R4, R5
T3L	24K832477	RF: Doubler-Driver; base stamped 477; includes two 46K821425 CORE, adjustable tuning and C12L, C13, C14L
T3ML	24B832072	RF: Doubler-Driver; base stamped 072; includes two 46K821425 CORE, adjustable tuning and C13
T3MM		same as T3ML

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		TRANSFORMER,
T3HL	24B832213	RF: Doubler-Driver; base stamped 213; includes two 46K821425 CORE, adjustable tuning and C13
T3HM		same as T3HL
T3HH		same as T3HL
		TUBE,
V101	6AK6	Electron
V102	12AT7	Electron
V103		same as V101
V104	6AQ5	Electron
V105	6146	Electron
V106	6BH6	Electron
V107	6AL5	Electron
V201		same as V101
		SOCKET, tube: female;
XV101	9K87124	7 contact; miniature molded mica filled phenolic base; includes center shield; saddle mounting
XV102	9K825586	9 contact; miniature; molded mica filled phenolic base; includes center shield and tube shield base; saddle mounting
XV103		same as XV101
XV104		same as XV101
XV105	9B890001	8 contact; brown bakelite wafer base; saddle mounting
XV106	9B834083	7 contact; miniature molded mica filled phenolic base; includes center shield and tube shield base; saddle mounting
XV107		same as XV106
		SOCKET, tube:
XV201		same as XV101
		SOCKET, crystal: female;
XY101	9A30451	4 contact; square molded mica filled bakelite base; chassis mounted
XY201		same as XY101
		CRYSTALS,

NOTE

Crystal Units are part of the Radio Set model. When ordering a transmitter chassis only, crystals must be ordered separately. Crystal type number and operating frequency must be specified when ordering crystal.

		CRYSTAL UNIT,
Y101	Type RN3-A	Quartz: Transmitter Oscillator; 2. 08333 - 4. 50000 MC; with 6 volt heater unit
Y201		same as Y101

PERFORMANCE SPECIFICATIONS

INPUT REQUIRED	12 VDC negative or positive ground.
OUTPUT RATINGS	Transmitter:
	High B+ . . . . . 705 v d-c at 120 ma
	Low B+ . . . . . 275 v d-c at 60 ma
	Osc. B+ . . . . . 150 v d-c at 18 ma
	Bias . . . . . -36 v d-c
	Receiver:
	B+ . . . . . 200 v d-c at 70 ma

b. Advantages

The transistorized power supply has several advantages over the conventional vibrator supplies in current use. These advantages are largely due to the life span of the transistor, which greatly exceeds that of even the finest vibrator. This eliminates the cost of vibrator replacement, reduces maintenance, increases the reliability of the radio set and provides higher efficiencies with lower input drains for the same power outputs. With a transistorized power supply there is much less chance of radio failure in service.

In addition, the transistor circuit has a built-in protection factor not found in vibrator supplies. A short in the output does not damage the transistors.

2. DESCRIPTION

The TU588 Power Supply is designed for a 12-volt negative or positive ground electrical system.

The power supply chassis mounts between the transmitter and receiver of the radio set. The d-c input and control circuits are brought in through a 19-pin male connector on the front panel. The various rectified outputs are routed to terminal boards on the wiring side of the chassis for the transmitter and receiver connections. An 18-lug terminal strip on one side is used for the transmitter connections; a 15-lug strip on the other side is for receiver connections.

Two alloy junction PNP transistors--designed for high power audio frequency applications--are connected in an electronic switching circuit which is basically a multivibrator. The operating frequency is in the audio range.

The transistors are mounted on a cast-aluminum radiator (called a "heat-sink") on the front panel of the radio set. The radiator conducts heat away from the transistors, permitting them to operate safely at relatively high ambient temperatures. The heat-dissipating capacity of the heat-sink provides safe operation under the most adverse temperature conditions normally encountered in mobile radio operation.

CAUTION

A transistor feedback circuit in this power supply is enclosed in a protective cover. The cover prevents accidental shorting of the enclosed components with consequent damage to the transistors. Do not remove this cover unless necessary for servicing components. Always replace the cover before restoring operation. Never operate the power supply with the cover removed.

3. OPERATION

a. Introduction

The function of the mobile power supply is to convert the low-voltage d-c input to the various high-voltage d-c outputs required for operation of the transmitter and receiver. This is accomplished in three stages. First, the transistor

circuit changes the d-c into a-c, then the power transformer steps up the voltage of the a-c, and finally the rectifier-filter network converts the high voltage a-c to d-c.

b. Transistor Multivibrator Circuit

(1) Function

The function of the transistor multivibrator circuit is to change the pure d-c input into pulsating d-c, a form of a-c, so that it can be stepped-up in voltage by transformer action. The operation is illustrated in the simplified functional diagram, Figure 1. The diagram shows a negative ground electrical system. For a positive ground electrical system, reverse the leads to the polarity reversing terminals.

(2) Operation

The ON-OFF switch at the control head connects the 12 volt d-c input to pin #19 of the power and control plug on the power supply. When the switch is ON, the d-c input is applied to two points: (a) the feedback network used in the "receive" condition, and (b) the center tap of the main transformer winding.

(a) Feedback Path

The path through the "receive" feedback network leads to the center tap of the feedback winding of the transformer. The opposite ends of this transformer winding are connected to the two transistor base elements. The 330 ohm starting resistor is connected between the center tap and the d-c input. Current flows through the feedback network and starting resistor, applying a bias to the base elements of each transistor. Due to a slight unbalance in transistor conductivity, one will tend to conduct more heavily than the other. This is the effect which starts the oscillation cycle.

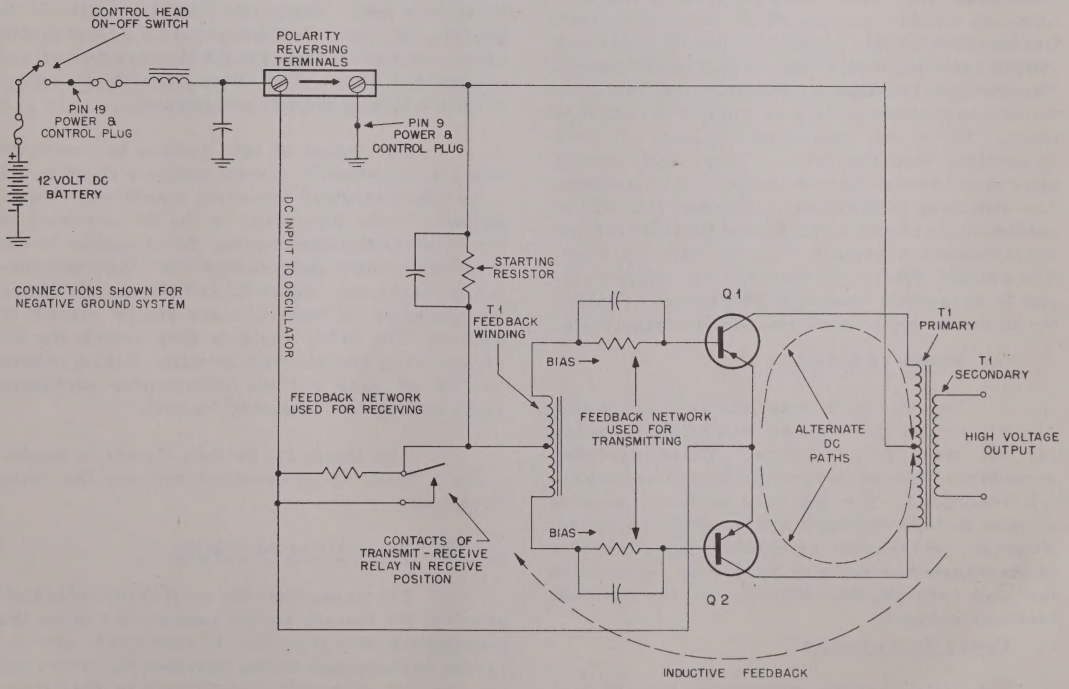


FIGURE 1

CEPD-1267-A

(b) Transformer Primary Path

The d-c path through the center tap of the main transformer primary winding leads to the two transistor collector elements, which are connected to opposite ends of the winding. The slight unbalance in transistor conductivity causes more current to flow through one primary half-winding than through the other. The current path is through the primary half-winding and the transistor (emitter to collector) to the d-c input. The current in the transformer half-winding induces voltages in the two feedback half-windings. Polarity is such that the more heavily conducting transistor is quickly biased to full conduction; the other transistor is quickly driven to cut-off.

(3) Oscillation Cycle

The induced feedback voltage drops to zero as the current through the conducting transistor reaches the point of saturating the transformer core. The cut-off transistor begins to conduct, reversing the polarity of the voltage in the feedback windings and conduction through this transistor increases inducing greater feedback bias and quickly cutting off the first transistor. Current through the second transistor then reaches core saturation, completing a cycle of oscillation. The circuitry is designed for self-sustaining, continuous oscillation as long as the d-c input is applied. First one transistor conducts to core saturation, then the other. Thus, the current alternates between the two primary half-windings. The switching action is very rapid and the voltage induced in the feedback winding of the transformer approximates a typical "square wave" pattern. The overall effect of the transistor oscillator circuit is essentially that of a single-pole, double-throw switch operating back-and-forth continuously.

(4) Feedback Networks

Two feedback networks are used in this circuit, one for the "receive" condition, the other for the "transmit" condition. These networks provide the proper bias for both receive and transmit conditions. The transmit feedback network is used in both transmit and receive conditions. However, in transmit condition, closed contacts of the transmit-receive relay by-pass the receive feedback network, thus utilizing only the transmit feedback network.

c. Power Transformer

The main purpose of the power transformer is to provide a high voltage a-c output with a low-voltage a-c input. A special transformer is used in this power supply to provide the feedback required for the transistor oscillator circuit in addition to the high voltage a-c output. There are two separate high voltage secondaries for the B+ outputs and one low-voltage secondary for the bias supply.

d. Rectifier-Filter Networks

Refer to Schematic Diagram 63E856462.

(1) Receiver B+ Section

The receiver B+ rectifier-filter network converts the high voltage a-c induced in the transformer secondary to a smooth d-c output required for the receiver plate circuits. This section consists of a full-wave silicon bridge rectifier (CR9, CR10, CR11 and CR12) a "pi" section filter and a bleeder resistor.

The high voltage a-c is connected to opposite corners of the bridge circuit. On one half-cycle rectifier CR9 conducts toward the transformer and CR12 conducts in the direction of the filter and load, which completes the circuit to ground. On the other half-cycle CR11 conducts toward the transformer and CR10 conducts current toward the filter. The filter network smoothes out the ripple in voltage and current.

The output of this section is connected to a set of normally closed contacts of relay K1 in the de-energized (receive) condition. These contacts route the output to the B+ terminals of the receiver terminal board. B+ is applied to the receiver continuously except when the transmitter is turned on. Relay K1 is then energized and the receiver is muted, since its B+ circuit is broken. The relay contacts then switch the B+ output to the transmitter terminal board, where the B+ is used for the transmitter oscillator stage during the "transmit" period.

The lamp, I1, in this circuit is essentially a fuse. If an overload occurs, the lamp burns out.

(2) Transmitter B+ Section

The transmitter B+ section provides high and low B+ outputs to the transmitter when the transmit-receive relay (K1) is energized. Pressing the push-to-talk button operates this relay and its contacts complete the circuit to the bridge rectifier, CR1 to CR8. The rectifier bridge output is connected so that its B+ output is added to

the output of the multiplier B+ section, providing a transmitter B+ of approximately 705 volts. This output is filtered and routed through closed contacts of relay K1 to the transmitter PA B+ terminal, TB2-10.

The full winding of the transformer secondary provides an intermediate B+ source for the transmitter multiplier stages. The bridge network consisting of CR9 to CR12 is used as the rectifier in this circuit. The multiplier B+ output is filtered and routed through terminals of relay K1 to the multiplier B+ terminal, TB2-11. The transmitter oscillator voltage is obtained from the same source as the multiplier B+, however, the higher multiplier B+ is fed through a dropping resistor network and through contacts of relay K1 to the transmitter oscillator terminal, TB2-6.

(3) Transmitter Bias Section

The transmitter bias section includes a low-voltage secondary of transformer, T1, rectifier CR13 and a filter network. The -36 volts bias output appears on TB2-13 for connection to the transmitter PA grid circuit.

The HI-LO switch is in the transmitter (PA screen) circuit. The HI position is the normal operating position. The LO position is used for transmitted tuning purposes before the final amplifier of the transmitter is fully aligned.

e. Relay Operation

The transmit-receive relay, K1, is a 12 volt d-c relay. One side of the relay coil is connected to the 12 volt bus. To energize the relay, the other side of the coil must be grounded.

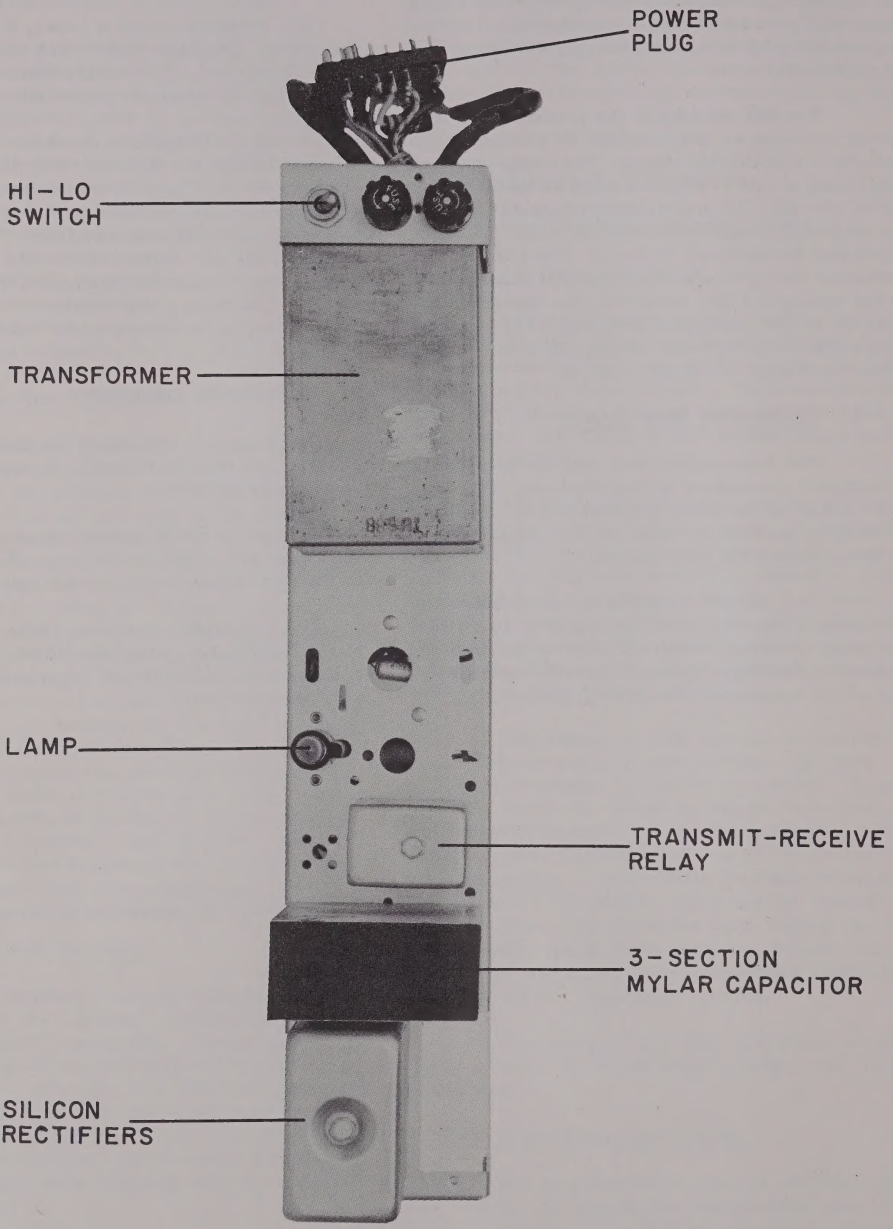
In the de-energized condition, all operating voltages for the receiver are supplied through the contacts of the relay. When the push-to-talk circuit is grounded, the relay becomes energized and the relay contacts are switched. The switching removes the B+ voltage from the receiver and supplies operating voltages to the transmitter final stages. Therefore, the receiver is muted and the transmitter is turned on when the relay is energized.

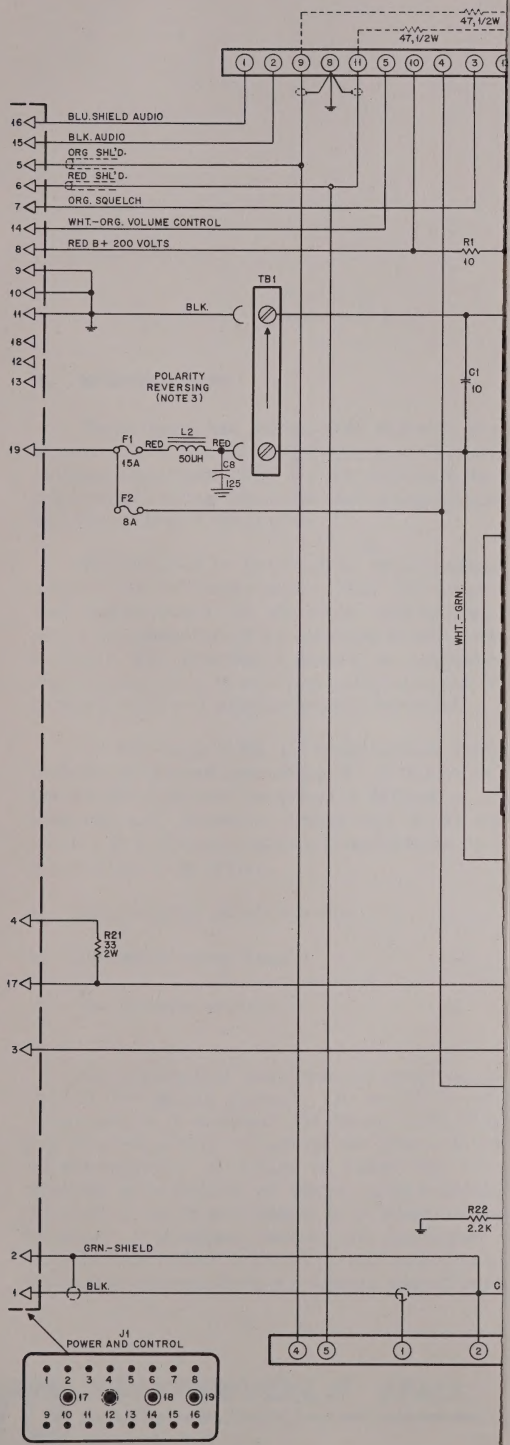
4. TRANSISTOR CHECKING

A short in a transistor is the most frequent cause of transistor failure. A simple check can be made as follows:

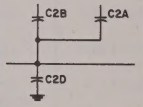
Connect a multi-meter between the emitter and collector of the transistor. If the transistor is shorted, the meter will read less than one ohm.

If a transistor requires replacement, refer to the INSTALLATION AND OPERATION section of this instruction manual for transistor replacement procedures.

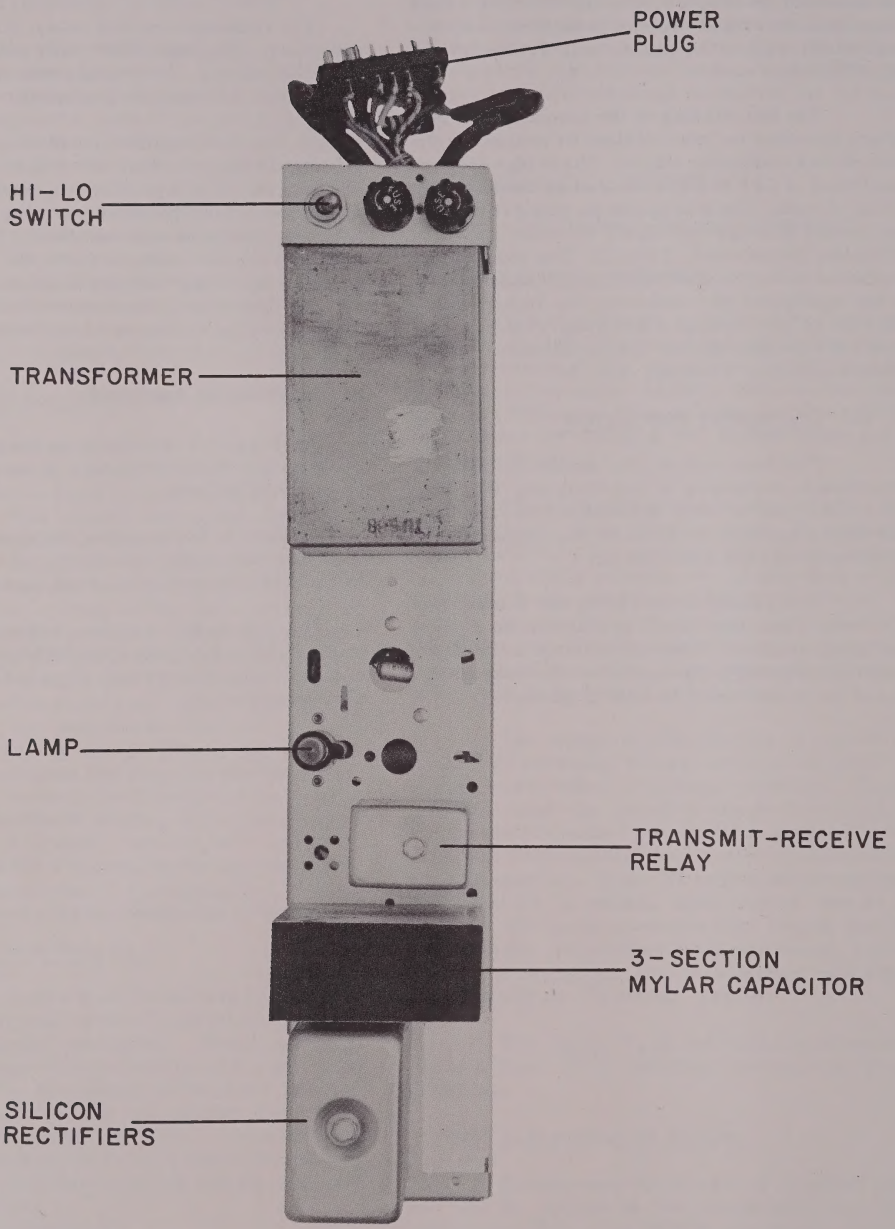

POWER PLUG
HI-LO SWITCH
TRANSFORMER
LAMP
TRANSMIT-RECEIVE RELAY
3-SECTION MYLAR CAPACITOR
SILICON RECTIFIERS



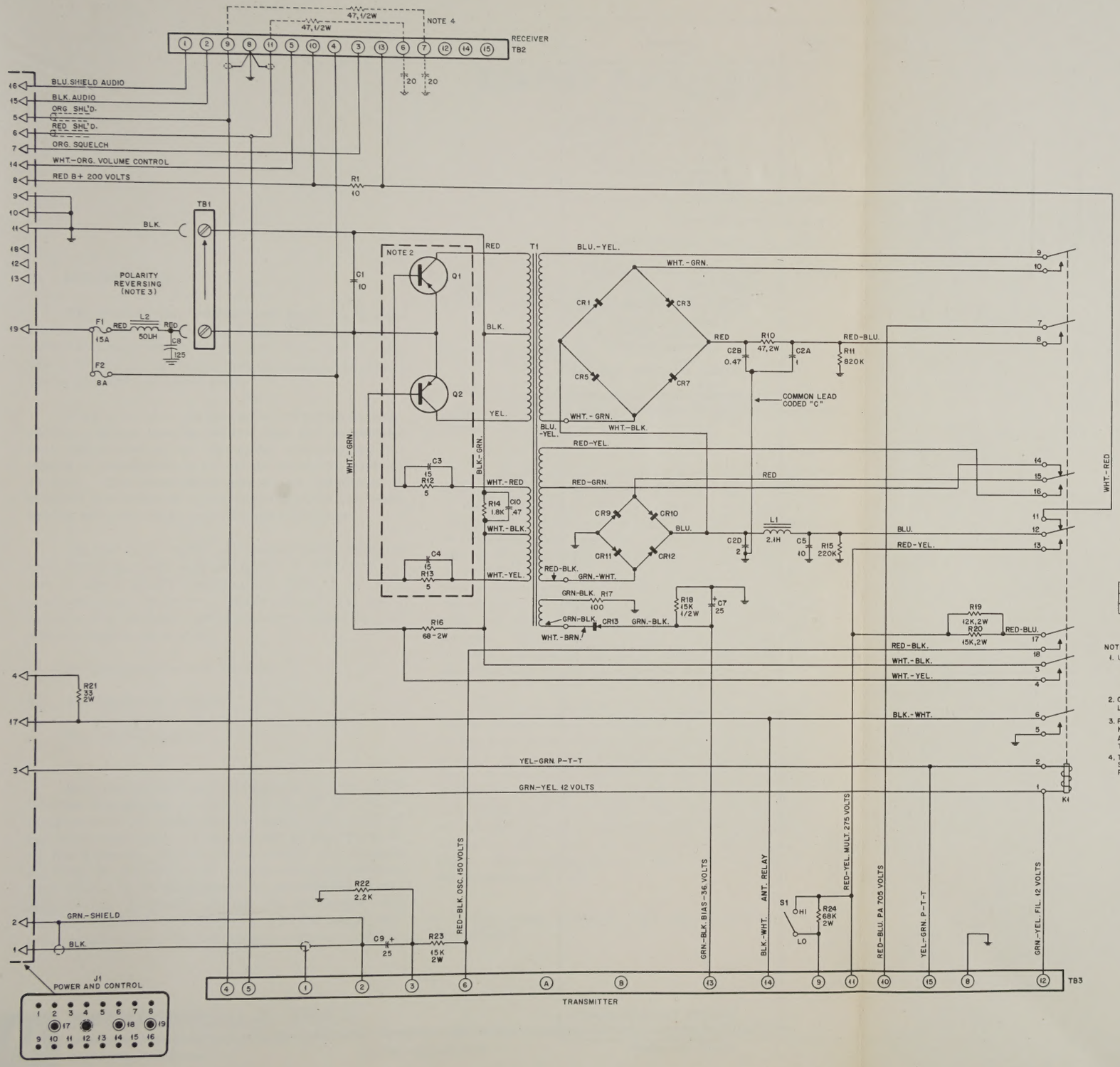
REVISIONS

DIAG. ISSUE	CHASSIS SUFFIX	REF. SYMBOL	CHANGE	LOCATION
C	TU588-3	DS1	LAMP REMOVED	FROM 275 VOLT CIRCUIT
		L2	WAS 120 uh	IN 12 VOLT LINE
		C2	TYPE CHANGE AND CIRCUIT WAS: 	HI VOLTAGE OUTPUT CIRCUIT
D	TU588-4	R16	WAS 150 OHMS	PRIMARY VOLTAGE INPUT CIRCUIT IN SERIES WITH F1
		C6	1 uf REMOVED	
		R14	WAS 330 OHMS	PRIMARY OF T1
		C10	.47 uf ADDED	
		L2	RELOCATED, WAS IN SERIES WITH F2	PRIMARY VOLTAGE INPUT CIRCUIT IN SERIES WITH F1
		C8	RELOCATED, WAS IN SERIES WITH F2	
E	TU588-5		TLN6155A 2-FREQ. RCVR. FILTER KIT ADDED TO SCHEMATIC REFERENCE. SEE NOTE 4	TB2 & J1
F	TK661-1	Q1 Q2	WAS 48A125286	FRONT PANEL SEE NOTE 2
	TU588-5		1V859763 MTG. BD. ASSEM. WAS REPLACED WITH 1V865695 TERM. BD. ASSEM.	NON-REFERENCE PARTS LIST

TU588 Power Supply
Schematic Diagram
Motorola No. 63E856462-F (Rev.)
11/5/59-RCS



AEPD-1312-O (CE978B)

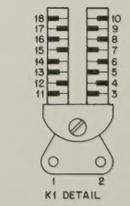


MODEL TABLE

MODEL	DESCRIPTION
TU588-5	TRANSISTOR POWER SUPPLY
TK661-1	FRONT PANEL

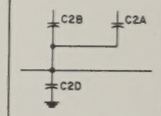
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1 WATT K=1000 OHMS.
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. COMPONENTS ENCLOSED IN DASHED LINES ARE LOCATED ON FRONT PANEL.
3. POLARITY REVERSING TERMINALS SHOWN FOR NEGATIVE BATTERY GROUND (BLK. TERMINAL TO ARROW). FOR POSITIVE BATTERY GROUND, REVERSE THE TWO TERMINALS (RED LEAD TO ARROW).
4. TLN6155A RCVR. FILTER KIT IS P/O 2-FREQ. RADIO SET ONLY. REFER TO INTERCABLING DIAGRAM FOR PARTS IDENTIFICATION.



K1 DETAIL

REVISIONS

DIAG. ISSUE	CHASSIS SUFFIX	REF. SYMBOL	CHANGE	LOCATION
C	TU588-3	DS1	LAMP REMOVED	FROM 275 VOLT CIRCUIT IN 12 VOLT LINE
		L2	WAS 120 uh	
		C2	TYPE CHANGE AND CIRCUIT WAS: 	HI VOLTAGE OUTPUT CIRCUIT
D	TU588-4	R16	WAS 150 OHMS	PRIMARY VOLTAGE INPUT CIRCUIT IN SERIES WITH F1
		C6	1 uf REMOVED	
		R14	WAS 330 OHMS	PRIMARY OF T1
		C10	.47 uf ADDED	
		L2	RELOCATED, WAS IN SERIES WITH F2	PRIMARY VOLTAGE INPUT CIRCUIT IN SERIES WITH F1
		C8	RELOCATED, WAS IN SERIES WITH F2	
E	TU588-5		TLN6155A 2-FREQ. RCVR. FILTER KIT ADDED TO SCHEMATIC REFERENCE. SEE NOTE 4	TB2 & J1
F	TK661-1	Q1 Q2	WAS 48A125286	FRONT PANEL SEE NOTE 2
	TU588-5		1V859763 MTG. BD. ASSEM. WAS REPLACED WITH 1V865695 TERM. BD. ASSEM.	NON-REFERENCE PARTS LIST

TU588 Power Supply
Schematic Diagram
Motorola No. 63E856462-F (Rev.)
11/5/59-RCS

MOTOROLA PART No.	DESCRIPTION
9B865564	FUSEHOLDER: extractor post type; molded black bakelite bayonet base; single hole chassis mounted; for 1-1/4" long x 1/4" dia. fuse; includes cap, lock-washer and mounting nut same as XF1
	NON-REFERENCED PARTS
1V865695	RECTIFIER MOUNTING BOARD ASSEMBLY, riveted; includes: 31A865187 MOUNTING BOARD ASSEMBLY; includes 4 pairs of terminal clips for mounting 4 diodes; 2 req'd 7B858571 BRACKET, mounting board
7D865605	RADIATOR, transistor mounting
14A851751	INSULATOR, transistor; 2 req'd

ROUTINE MAINTENANCE

1. INTRODUCTION

Experience has shown that there is a particular way of maintaining 2-way radio communications equipment that is far superior to any other in achieving maximum operating efficiency and reliability at least cost.

This procedure is known as "System Maintenance", which simply means that the inspection and maintenance of all units constituting the whole is conducted in an established and orderly fashion. The procedure should be conducted at regular intervals in order to yield all of the well-known benefits of preventive maintenance.

All two-way radio communications systems include integrated assemblages. A failure in any one of these would constitute a failure of communications. However, there are three major factors in a mobile radio communications system which require attention:

a. The primary power source

b. The basic radio units

c. The antenna system

Any successful maintenance program must include the entire system. It would be of no consequence to maintain the basic radio units at top efficiency only to ignore the primary power or the antenna. A failure in either one results directly in a failure of radio communications. Therefore, to be successful in preventive maintenance, a program should be developed and closely followed on a basis of all-inclusive system maintenance. Such a program should include a periodic check on all the factors constituting a radio communications system as follows:

a. Primary Power

Automobile batteries usually fail after a long period of undercharging or overcharging, lack of water, poor connections and old age.

It is important to measure the voltage available at the battery terminals when under a load. A fully charged lead-acid battery will have a measured voltage of approximately 13.0 volts for a 12 volt battery and 6.5 volts for a 6 volt battery. An old sulphated or undercharged battery may show lower voltages. These are battery terminal voltages, not the voltage present at the radio set. The terminal voltage at the radio set will decrease when transmit current is being drawn. The voltage will be lowered approximately 1.1 volts for a 12 volt system and approximately .8 volt for a 6 volt system.

One of the good methods of checking primary power trouble is to measure battery voltage both at the terminals of the battery and at the equipment. An immediate drop in voltage of more than .2 volts measured at the battery on a short transmit cycle would indicate a battery in poor condition. A drop of more than 1 volt measured at the units would point to troubles in the primary circuit--cable, fuse block, relay or chassis return. This voltage drop is excessive and should be investigated fully.

"A" relay contacts wear out, requiring replacement.

PARTS LIST for Power Supply Diagram 63E856462-F (Rev.)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed:
C1	23K859299	tantalum; 10 uf +75-15%; 25 vdcw
C2	8K861326	mylar; consists of:
C2A		1 uf ±20%; 900 vdcw; coded "A"
C2B		.47 uf ±20%; 900 vdcw; coded "B"
C2C		common connection; coded "C"
C2D		2 uf ±20%; 400 vdcw; coded "D"
C3	23K858677	electrolytic; tubular; 15 uf +100-10%; 10 vdcw
C4		same as C3
C5	23K837903	electrolytic; tubular; 10 uf +50-10%; 450 vdcw
C6		NOT USED
C7	23K839917	electrolytic; tubular; 25 uf +100-10%; 100 vdcw
C8	23K840707	electrolytic; tubular; 125 uf +100-10%; 18 vdcw
C9	23K850516	electrolytic; tubular; 25 uf +100-10%; 50 vdcw
C10	8K861614	mylar; tub; .47 uf ±10%; 100 vdcw
		CRYSTAL UNIT, rectifying: silicon junction; cartridge
CR1	48K859727	type 1N1223
CR2		NOT USED
CR3		same as CR1
CR4		NOT USED
CR5		same as CR1
CR6		NOT USED
CR7		same as CR1
CR8		NOT USED
CR9	48K859708	type 1N1222
CR10		same as CR9
CR11		same as CR9
CR12		same as CR9
CR13	48K859726	type 1N1219
		FUSE, cartridge: one time:
F1	65K804906	slow blow type: glass; 15 ampere, 32 volt; 1-1/4" long x 1/4" dia.
F2	65K475248	slow blow type; glass; 8 ampere; 32 volt; 1-1/4" long x 1/4" dia.
		CONNECTOR, receptacle:
J1	28C802820	male; 19 contact; polarized; rectangular molded black phenolic insulator; chassis mounted
		RELAY, armature:
K1	80K858550	dual stack; contact arrangement: 1st stack, 1 form "A", 2 form "C", 2nd stack, 4 form "A"; coil resistance 100 ohms; does not include 15K848892 COVER, relay, nor 7A811735 BRACKET, relay cover mounting; cover and bracket must be ordered separately

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		REACTOR:
L1	25B837416	filter; 2.1 henries at 100 ma. dc
		COIL, AF:
L2	25B861375	choke; 50 microhenry
		TRANSISTOR:
Q1	48A124376	P-N-P
Q2		same as Q1
		RESISTOR, fixed: carbon; ±10%; 1 w; ins.; unless otherwise stated
R1	6R118205	10 ohm ±20%
R2		NOT USED
R3		NOT USED
R4		NOT USED
R5		NOT USED
R6		NOT USED
R7		NOT USED
R8		NOT USED
R9		NOT USED
R10	6R488035	47 ohm; 2 w
R11	6R2053	820K
R12	17K858769	wire-wound; 5 ohm; 5 w
R13		same as R12
R14	6R5620	1.8K ohm
R15	6R5574	220K
R16	6R118239	68 ohm; 2 w
R17	6R6415	100 ohm
R18	6R6477	15K; 1/2 w
R19	6R5766	12K; 2 w
R20	6R5732	15K; 2 w
R21	6R488016	33 ohm; 2 w
R22	6R6409	2.2K
R23		same as R20
R24	6R2079	68K; 2 w
		SWITCH, toggle:
S1	40A482097	S.P.S.T.
		TRANSFORMER, power:
T1	25D858644	transistor controlled; consists of the following windings: primary #1: YEL, RED leads with BLK center tap; total resistance .031 ohms; primary #2: WHT-RED, WHT-YEL leads with WHT-BLK center tap; total resistance .040 ohms; secondary #1: BLU-YEL, BLU-YEL leads; resistance 21.5 ohms; secondary #2: RED-BLK, RED-YEL leads with RED-GRN tap; total resistance 12.6 ohms; secondary #3: GRN-BLK, GRN-BLK leads; resistance 2.26 ohms
		BOARD, terminal:
TB1	31A858723	2 screw terminals
TB2	31B802699	14 solder lug terminals; board coded 1 to 15
TB3	31B851408	17 solder lug terminals; board coded B, A, and 1 to 16

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		FUSEHOLDER:
XF1	9B865564	extractor post type; molded black bakelite bayonet base; single hole chassis mounted; for 1-1/4" long x 1/4" dia. fuse; includes cap, lock-washer and mounting nut
XF2		same as XF1
		NON-REFERENCED PARTS
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"A" relay contacts wear out, requiring replacement.

Fuses get tired, sometimes even when new they may have too much resistance. Check and replace if voltage drop exceeds .1 volt.

Connections loosen as a result of vibration. Tighten or resolder.

Fuse Holders also loosen because of vibration. They lose their temper because of heat resulting from poor contact. Acid causes corrosion. Accumulation of oil and dirt increases contact resistance and the remedial action is to clean contacts, tighten or replace.

Keeping voltage drops to a minimum in a primary circuit is very essential to good system operation. The same rules apply to other sources of power. Dry batteries especially must be checked under full load. Some knowledge of the number of hours of use must be available as an indication of when they most likely will need to be replaced.

b. Unit Assemblages

These include transmitter, receiver, power supply, and associated units. Very few adjustments need to be made regularly in transmitter and receiver units. To catch a maximum number of incipient troubles, the technician must use his eyes, his ears, his sense of touch, and meter measurements, as well as his good judgment and past experience.

Basically four types of observation are required:

Listening Tests

An experienced technician can often detect warnings of impending trouble by noting the audio quality, the noise background and the squelch operation in relation to the settings of the volume and squelch controls. He will come to know the normal signal level he should obtain at given locations with selected stations in a particular system. Degradation of performance will be immediately apparent to the technician who checks the set periodically, whereas the steady operator may become accustomed to a gradually degraded performance.

Visual Inspections

Look for loose bolts, screws and clamps, worn handset cords, burned out pilot lights, arcing at any point, loose or broken components, burned resistors or loose connections. A good visual inspection not only is a means of quickly locating the source of trouble, but may prevent more serious trouble from developing later.

Touch

The fingers are good detectors of improper temperature conditions. Fuses, fuse holders, crystal ovens, transformers and relay coils which are too hot mean trouble. Also, a cold crystal oven, tube or resistor that should normally be warm is probably in trouble. Such tests are quick and should be used often.

Meter Measurements

Actual quantitative measurements of "A" and "B" voltages, grid and plate currents, power output, frequency and deviation have no substitute; their meaning is definite. Experience will indicate to what degree variation can be tolerated. Good test equipment is essential to good system performance.

c. Antennas

Visual check of antenna, antenna mount, cable, and connectors should be made periodically, as well as a meter check to find any open or shorted lines. Remember that the antenna must efficiently radiate the power developed in the transmitter chassis and also transfer to the receiver the minute voltages picked up from the distant transmitter to produce a good audible signal. Failure of the antenna or line is a failure of the communications system.

d. Netting

Netting of receivers and transmitters in any system is more important than usually realized. The term "netting" means that all receivers and transmitters in a given system are aligned on the same frequency or frequencies. With modern selectivity requirements, it is more than ever necessary to tune every receiver exactly to the station it must receive. Careful "netting" of all units in an integrated system to the correct frequency is a first order requirement of a modern communications system and will eliminate a prime cause of poor system performance. It is in this field of system operation that the high frequency stability and selectivity stability is of major importance.

Frequent checks of transmitter deviation will improve system operation. A good rule to follow is to check performance frequently and make

adjustments only when actual tests and measurements show improper operation.

2. MAINTENANCE CHECKS

A good preventive maintenance program requires a complete system check at least every three months and it is recommended that individual records be kept of each unit. In a general way the following items should be part of any preventive maintenance routine.

a. Clean and dust the equipment thoroughly.

b. Make a thorough mechanical inspection of the entire mobile installation.

c. Check the battery terminals. Battery connections must be clean and tight at all times to prevent power losses due to excessive voltage drops across loose connections.

d. Check the fuses. Fuses must fit snugly in the fuse holders to prevent voltage drops at these points.

e. The vehicle battery should be checked at least once a month, however, it is recommended to make this check weekly to assure that it is properly charged. A specific gravity measurement is recommended for this purpose. The reading obtained should be in agreement with the normal operating specifications stipulated by the battery manufacturer.

f. Check the A-plus voltage at the battery and at the radio set with the radio equipment turned "on" and the vehicle motor turned "off".

g. Check the dc resistance from the inner conductor to the outer conductor of the antenna coaxial lead-in cable.

h. Power Input Cables

Power cable connections may be checked by measuring the overall voltage drop from the battery to the equipment. With the transmitter "on" and the vehicle motor running, the voltage drop from the ground cable of the radio equipment to the battery ground terminal should be negligible. The voltage drop in the power cable from the (hot) battery terminal to the equipment should not exceed 1 volt. Cable voltage drop will be the difference between the voltage reading obtained from the battery terminal to ground and the reading obtained from a voltage input point on the mobile equipment to ground. These voltage measurements should be made with an accurate dc voltmeter. Proper operation of this equipment depends upon correct input voltage. The input voltage may be measured at the fuse located on the top front end of the power supply chassis (terminal with yellow lead attached). The drawer assembly must be partially pulled out of the mobile housing to permit access to convenient voltage input measuring point.

i. Vehicle Generator and Voltage Regulator

Routine Maintenance Checks should be made on the vehicle generator and voltage regulator to insure proper operation of the radio equipment. Periodic maintenance should include:

(1) Checks of generator brush condition and replacement if necessary.

(2) Checks of generator armature condition.

(3) Check of generator output and voltage regulator setting. This setting should conform to either the car manufacturer's or the generator manufacturer's recommendations.

(4) Check of generator lubrication and relubrication if required.

j. Antenna

Routine preventive maintenance of mobile systems should include a continuity check of the braided lead between the antenna rod and the coaxial lead-in. Ordinarily hidden from view within the base assembly, the lead may become frayed or broken without attracting immediate notice. However, any decrease in RF continuity introduced here will cause a decrease in radiated power and receiver sensitivity. Moreover, intermittent contact can generate undesirable interference in the form of noise caused by:

(1) high contact resistance.

(2) imperfect bonding which permits the inherent noise to enter the receiver.

k. Clean the relay contacts.

l. Check all transmitter and receiver stage meter readings and replace any tubes and transistors as required.

Transistors located in the heat sink on the front panel are coated with DC-4 silicone grease. This grease increases the rate of heat transfer.

Note that a thin mica insulator is between each transistor and the front panel. When replacing a transistor, first coat it with silicone grease and place the insulator between the transistor and the front panel. There also must be silicone grease between the mica washer and the heat sink. Replace the mica insulator if it is damaged.

m. Check the filament voltage and the B+ voltages.

n. Set the transmitter oscillators on frequency.

o. Tune the entire transmitter.

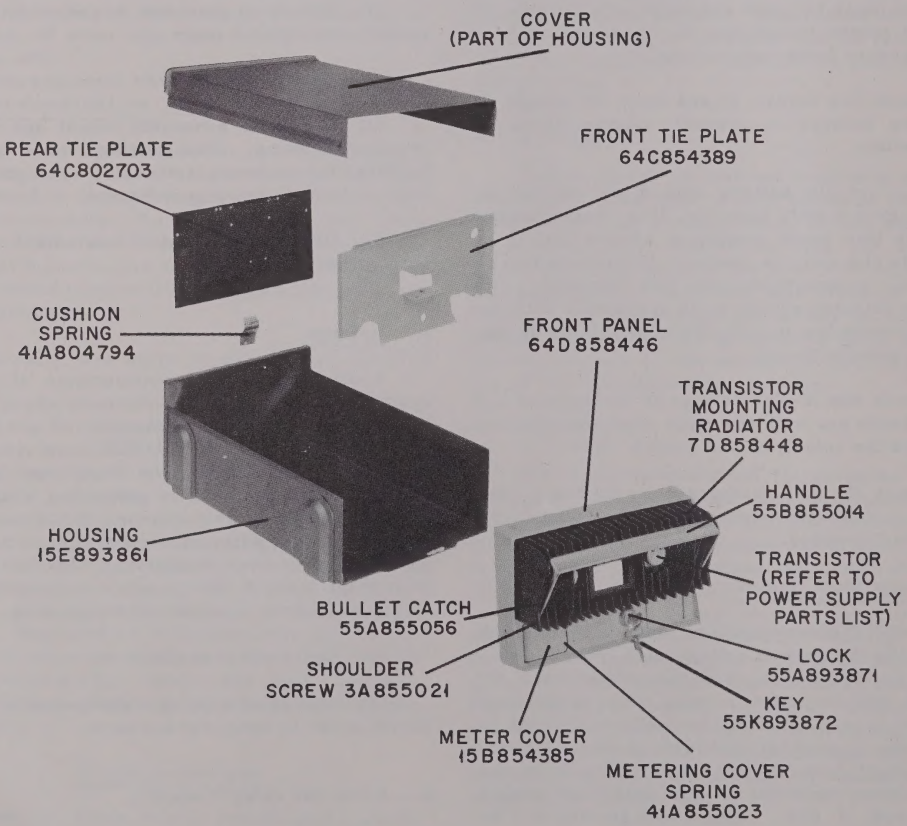
p. Check the transmitter modulation.

q. Tune the entire receiver.

r. Check the audio response against a fixed station.

NOTE

For detailed alignment procedures of the various chassis refer to the pertaining instruction section of this instruction manual.



HOUSING PARTS IDENTIFICATION DETAIL

AEPD-1285-O

SUPPRESSION OF IGNITION NOISE IN MOBILE EQUIPMENT

1. NOISE SUPPRESSION

Noise suppression requirements will vary quite widely with different vehicles, types of installation and types of system operation. System use and area coverage often determine how much noise suppression may be necessary. If the operating area is sufficiently small so that signal levels may always be high, less noise suppression will be required. Conversely for maximum range coverage and operation in weak signal areas, it becomes necessary to do a very good job of noise suppression. If the units are operating in areas with high ambient noise, it will not be necessary to do as good a job of vehicle noise suppression. It would obviously be uneconomical to spend time and money on noise suppression if the local ambient noise in the area is going to be higher than the vehicle interference levels. One of the first considerations is to determine that the noise is caused by the vehicle in which the receiver is located.

The Model TEN6018A Noise Suppression Kit is available for all vehicles equipped with two-way radio. Refer to diagram 69C854657 at the end of this section for a typical noise suppression installation.

2. SOURCE

The type of noise can generally be determined by its sound in the speaker. For best results in locating noise, the receiver should be receiving a weak signal which produces not less than 10 db. nor more than 30 db. noise quieting. Greater quieting will mask the noise by limiter action; less quieting will mask the specific noise with inherent receiver thermal noise. Impulse noise will probably be most noticeable between 20 and 30 db. of receiver noise quieting.

Ignition noise is characterized by regular "popping or snapping" heard at the speaker and will vary with the speed of the engine. This noise may be generated in the ignition coil, distributor, or the spark plugs and radiated from any lead connecting these components. A whining noise is probably generator interference. A harsh rasping noise is generated by gauges, particularly the pulsing type temperature gauge. Erratic "popping" while the vehicle is in motion is possibly the result of static electricity discharges from moving insulated parts of the vehicle. Erratic "popping" which increases as lights and other electrical accessories are turned on, can be the result of miniature arcs produced by minute potential differences between portions of the vehicle body, frame and motor block. These potential differences, for the most part, can be corrected by proper bonding practices.

3. RADIO EQUIPMENT POWER SOURCE

Power for the radio equipment should always be obtained directly from the battery rather than some other junction. Feedback and intercoupling can result between interfering currents of the vehicle electrical system and the radio circuits. In some cases these two systems can be intercoupled. It is always best to couple equipment directly to the battery to prevent this coupling as much as possible.

In addition, by connecting the radio's primary power lead directly to the battery instead of the starter key, the battery acts as a large capacitor and by-passes noise to ground. The radio ground return cable requires a secure, clean mechanical and electrical connection to the vehicle frame. The battery ground return should also be bonded to the frame. Utilizing the car frame as a common ground as much as practical, tends to minimize the possibility of inducing many unwanted parallel ground currents.

4. IGNITION

The vehicular ignition system is the worst offender from the standpoint of noise generation. The impulse noise produced must be kept under control by proper preventive maintenance and addition of suitable noise suppression items. It is necessary to check for: (1) distributor breaker points in good condition, (2) ignition condenser in good condition, (3) all ignition system connections free of corrosion and making good contact, (4) circuit continuity in the high voltage leads, (5) sufficiently high spark plug breakdown voltages, and (6) spark plug electrodes properly spaced and in good condition. Mobile installation kits usually require at least a noise suppressor resistor to be placed in the lead from the ignition coil to distributor and a shielded by-pass capacitor, to be connected from the ignition coil primary to ground.

5. RESISTANCE TYPE SUPPRESSORS

Additional elements in the ignition circuit are commonly used to attenuate the impulses. Resistor type spark plugs or spark plug suppressors, have been found to be of great assistance in many cases. While the manufacturer claims superior engine performance is obtained by using these plugs, it is recommended that a check be made to assure (1) that the proper plugs are being used, and (2) that the engine performance is at least equal to that obtained using standard plugs. The distributor noise suppressor can be eliminated if a distributor with a built-in resistor is substituted for the standard distributor. Resistance ignition cable can be substituted for standard ignition cable to obtain additional attenuation. In some cars, it has been found that excessive resistance in the spark plug circuit may produce rough idling, particularly in cold weather. Thus, it may not be possible to use a distributor noise suppressor, resistance ignition cable and resistor spark plugs simultaneously in all cars. Today some manufacturers are tending to pre-equip new models with either resistance ignition cable or resistor spark plugs, or both. In such cases, substitution need not be made. Later models have much higher ignition voltage and can, therefore, accommodate the higher total resistance.

6. SPARK PLUG LEADS

In stubborn ignition interference problems, be sure to check the continuity of the spark plug leads. Through use of an ohmmeter or some other continuity indicator, such as dry battery and small bulb, you may find one or more leads open. The first place to check is the spark plug end of the lead. In an ignition system where the end of the lead and the terminal is molded in rubber, the terminal is probably not soldered to the conductor. The connection may be strictly mechanical.

By squeezing the terminal with a pair of pliers, it may register continuity. In this case, the lead is probably satisfactory. With an intermittent indication, it may be necessary to either replace the lead or to open the terminal and solder the lead to the terminal. If the lead is replaced, be sure to check the replacement lead for continuity. If the soldered lead is in the open, be sure to provide suitable protection against weather induced terminal corrosion.

7. CONTACTS

It is always desirable to minimize the number of contacts required in an ignition system, to minimize interference as a result of poor connections. Thus, resistor spark plugs are preferred to standard spark plugs plus spark plug suppressors. Also resistance ignition cable is preferred to standard ignition cable plus series suppressors.

8. COUPLING

Ignition noise can be (1) coupled capacitively from high voltage to low voltage leads, (2) can be radiated from high voltage leads, (3) can be radiated from low voltage leads, (4) can be radiated from other metallic linkages due to shock excitation, (5) can be radiated from ignition leads, and (6) may be radiated from the distributor or ignition coil. Many trial-and-error methods of countering such problems are available, but may consume considerable time and expense in the process. Among the trial-and-error methods are those listed below.

If the lead between the ignition coil and the distributor, or any other ignition lead is a critical length for radiating on the receiver frequency, noise can be reduced by changing its length. Capacitive coupling from high voltage to low voltage leads can be minimized by achieving maximum separation between such leads. For extreme cases it can be minimized by shielding the leads or running the leads in a separate conduit. Complete shielding of the ignition coil and distributor has afforded some relief in a few stubborn cases.

9. DISTRIBUTOR

Ignition noise caused by distributor point sparking and/or radiation taking place and transmitted via associated primary wiring can be reduced by the following:

a. Install a coaxial .1 mfd capacitor at the battery input of the primary side of the ignition coil.

b. Great care should always be taken to be sure that all the wires are pushed completely down into the distributor head towers. Or, solder connections in the distributor cap towers to prevent arcs taking place in the secondary circuit.

c. Install a 10,000 ohm suppressor in the distributor center tower, if a suppressor lead is not used.

10. DC GENERATING SYSTEM

The DC generating system in a car creates a raspy sounding interference and one that is easily recognized by ear. The commutator noise and hash can be eliminated entirely by replacing the DC system with an AC generating system. If this is not contemplated, the following methods may be applied.

11. GENERATOR

Generator noise is characterized by a high pitched "whine" and varies with engine speed. With car in motion check with weak signal, ignition turned off, alternately engaging and disengaging the clutch to drive generator at various speeds.

Noise elimination in the generator system may be as follows:

a. Generator noise may be the result of dirty or worn commutators. Various manuals have instructions for balancing and dressing down dirty commutators. In some cases, commutators may be cleaned with fine sandpaper or dressing stone. Emery cloth should never be used for cleaning commutators. Generator noise can normally be kept at a low level if the brushes and commutator are kept in good condition.

b. Install a 0.5 mfd coaxial capacitor at the generator in series with the armature lead. Keep in mind that the portion of the lead between the condenser and the generator should be kept as short as possible. Any shielding that can be afforded to the armature terminal will be helpful.

c. Install a 0.5 mfd coaxial capacitor at the generator regulator (ARM) terminal in series with the armature lead to the generator.

d. Install a 0.5 mfd coaxial capacitor at the generator regulator (BAT) terminal in series with the battery lead. Keeping the leads on the regulator side as short as possible will benefit here also.

CAUTION

Do not connect a bypass capacitor directly from generator field terminal to ground. (See "Voltage Regulator").

e. In some cases it may be necessary to install shielded wiring between the generator and regulator to stop radiation from the primary winding. In such cases, it is necessary that the braid in shielding over the control wires be extremely well grounded at both ends and very near the connected items. It is necessary to run the shields up very close to the actual connection terminals in order to prevent "hot" areas from radiating interference.

f. Inductance and capacity "Pi" section filters may be sometimes required. Extremely low resistance RF filter coils, about one inch in diameter with 10 to 20 turns of #10 or #12 enameled wire, with each side bypassed to ground, through a .1 or .01 mfd. mica or good paper capacitor, physically mounted and protected will generally remove the last traces of generator noise. The Motorola P-346 generator filter can be utilized to this end.

g. Care should be used that all generator covers are free of paint and grease that might prevent good electrical connection with the generator frames.

NOTE

In all cases where coaxial capacitors are mentioned, they should not be replaced by standard by-passes. The standard by-pass displays a resonance effect with high attenuation, at about 2 megacycles. The coaxial type is non-inductive and has high attenutation, up into the U.H.F. region.

12. VOLTAGE REGULATOR

Voltage regulator noise is characterized by a "raspy" sound. Look for arcing of voltage regulator contacts. This noise may be reduced by installing a 3.3 ohm resistor in series with a .002 mfd capacitor (Maximum capacity allowable) in series with the field (F) terminal of the voltage regulator to a common ground with the generator. Resistor must be non-inductive carbon. However, three 10 ohm or 12 ohm resistors in parallel may be substituted. This voltage regulator suppression is often very important, since this noise may be as severe as the generator noise itself.

CAUTION

Never use a capacitor across the field contacts or between field and ground unless you also use the resistor, for such application will result in greatly reduced regulator life.

13. GAUGES

Gauge noise is characterized by a "hissing" or "crackling" sound which may be detected by jarring the individual gauges while the ignition switch is on. The effect of each individual gauge will be made more pronounced by disconnecting the "hot" lead of all gauges, except the one being checked. One of the most frequent offenders, the temperature gauge, can be corrected by by-passing the temperature gauge lead at the motor block with a .25-.5 mfd by-pass capacitor. However, several later models do not have the pulsing type gauge-senders. Many are merely "on" - "off" contacts associated with a red warning light for the abnormal condition.

14. OIL SENDER

Oil sender noise is characterized by a low-pitch clicking sound. The noise rate varies with the oil pressure and stabilizes at the point of maximum pressure. This interference can be eliminated by installing a .25-.5 mfd by-pass capacitor from the oil gauge lead terminal, on the oil sender, to ground.

15. STATIC CHARGES

Any moving part of the vehicle, insulated from the rest of the vehicle, can build up a static electricity potential, which discharges to produce noise. The front wheels, insulated from the axles by a film of grease, are the primary offenders on this score. Standard grounding brushes or springs, such as front wheel static eliminators, will be satisfactory in most cases where this interference is present.

16. BONDING

In most modern cars and trucks, the vehicle body and frame form the ground return for the electrical circuits. Differences in conductivity, inadequate bonds between adjacent conductors and unequal current distributions result in potential differences throughout the vehicle. The miniature arcs created by these potential differences can be eliminated by eliminating the potential differences themselves. Effective use of copper bonding braid or brass contact wipers will minimize this interference.

Bonding the hood, the exhaust pipe and the muffler, as well as the motor block to the frame will probably provide the greatest improvement. The hood can utilize contact wipers along the edges plus copper braid at the hinge. The copper braid may be placed along the edge of the body so that the hood will mesh into it as it closes. The end of the braid should be connected to the hood with sufficient slack to prevent breakage at the hinge. The exhaust pipe and muffler are often suspended from the frame with a rubber mounting, therefore good contact can be obtained only by additional bonding. Although the engine is already grounded to the frame, with copper braid, additional bonding may be required.

17. COUNTERPHASING OR NOISE BALANCING

It is a characteristic of a FM receiver that, at one point in the alignment, a null point in impulse noise response will be reached. This null may vary from installation to installation. As it leaves the factory, the receiver is tuned to the exact operating frequency and is properly adjusted for proper noise balance. However, if it is found necessary to noise balance the receiver at some future date or in some specific installation, the correct procedure should be used, as follows:

Adjustments should be made with the receiver installed in the mobile vehicle and the vehicle engine running.

a. Turn the equipment "on" and allow it to warm-up for at least five minutes.

b. Radiate a signal on the frequency of the receiver. The signal can originate from a MOTOROLA portable test set with a built-in crystal-controlled peaking generator and correct transmitter crystal, from a signal generator or from a distant transmitter.

The receiver should be on frequency. The received signal should be just strong enough to produce 10 to 30 db quieting.

c. Turn up the receiver volume to a normal listening level.

d. Start the vehicle and let the engine idle. Connect the portable test set to the receiver metering receptacle. Put the test set in position 2. If a portable test set is not available, Multimeter AN/PSM-4 may be used.

e. If adjustment of the second mixer coil does not prove effective, adjust any one of the first i-f coils until ignition noise is substantially reduced.

The first i-f coils are very sensitive and may only be adjusted a very slight amount without reducing receiver gain. When making ignition noise balance adjustments, do not decrease the meter reading more than one-half microampere.

f. If satisfactory reduction of audible noise cannot be obtained by the methods previously described, the secondary winding of the discriminator is probably not aligned to exactly 455 kc. Align the discriminator as described in the receiver alignment procedures.

Noise balancing a receiver may result in an appreciable amount of noise reduction, however, this method alone may not reduce all of the apparent ignition noise. Some vehicles with a minimum of ignition noise interference may require only noise balancing the receiver. Whereas other vehicles will require ignition noise suppression in addition to noise balancing.

18. SUMMARY

Even when no specific noise problem exists, countermeasures should be employed to maximize range and intelligibility. These countermeasures should limit the noise at its source. When noise problems do exist, follow the corrective measures suggested in the instruction manual, and include the following:

1. Check for spark plug breakdown under a compression test.
2. Use resistor spark plugs, spark plug suppressors or resistance ignition cable.
3. Check condition of generator brushes, commutator, armature co-axial and by-pass capacitors. The generator covers should be free of paint and grease that might prevent good electrical connections with the generator frame.
4. Install 3. 3 ohm resistor in series with a .002 mfd capacitor from the field terminal (F) of the voltage regulator to a common ground with the generator.
5. Check for the proper bonding, tail pipe grounded to frame with copper braid, motor block grounded to the frame, etc.
6. By-pass oil sender, gauges.
7. Check for open circuits in the high voltage leads between the spark plug and distributor.
8. Check and adjust the distributor points and check the ignition capacitor.
9. See that power for the radio equipment is obtained directly from the battery.
10. Noise balance the vehicle radio receiver.

Specific noise sources may be isolated to some extent, under specific conditions. When the vehicle is standing still with the ignition switch off, any noise heard will probably be external to the vehicle. Static discharge noise will be added when the vehicle is moving with the ignition switch off. If the vehicle is coasting in gear, with the ignition switch off, generator noise will be added to the others, if present. Noise produced by inadequate bonding will be most noticeable when maximum current is being drawn from the battery, and may be increased when the vehicle is in motion. Care should be used to be sure that noise tests are made both with and without weak signals. Also, care should be used to check with squelch control in the unsquelched or maximum sensitivity condition.

Radiating a signal from the Model 80R generator to the vehicle antenna system is most useful in establishing a reference level to determine when any improvement in noise reduction is made.

The use of a co-axial flexible lead, with a probe pick up loop about one inch diameter, connected to a separate powered radio set or oscilloscope and utilized as a search wand to find the hottest areas, has been found to be most useful.

It is impossible to give an exact procedure to counteract noise in all cases; too many variables exist. With an understanding of some of the sources of noise, an intelligent approach will often save considerable time. Ignition noise suppression can add to both operational efficiency and operator satisfaction.

Other suggestions for noise suppression aids are as follows:

DESCRIPTION	PART NO.
Hood Wiper Kit	1V81618
Incl.: 4 Hood Wipers	39A4205
4 Tapping Screws (8x3/8).	3S7516
Wheel Static Collector Assembly.	1K534254
Incl.: 2 Wheel Static Collectors	1K534255
2 Wheel Static Collector Springs. . .	41B534253
2 Wheel Static Collector Contacts . .	39A534252

NOISE IDENTIFICATION AND SUPPRESSION CHART

Characteristics of Noise at Speaker	Source of Noise	How to Check Source of Noise	How to Suppress Noise
Identified as popping sound	Ignition	Noise varies in frequency with engine speed and will disappear when ignition is switched off.	1. Check to be sure: (1) Distributor breaker points are in good condition. (2) Ignition condenser is in good condition. (3) All ignition system connections are free of corrosion & making good contact. (4) THERE IS DC CONTINUITY IN HIGH VOLTAGE LEADS. (5) There are sufficient high spark plug breakdown voltages. (6) Spark plug electrodes are properly spaced and in good condition.

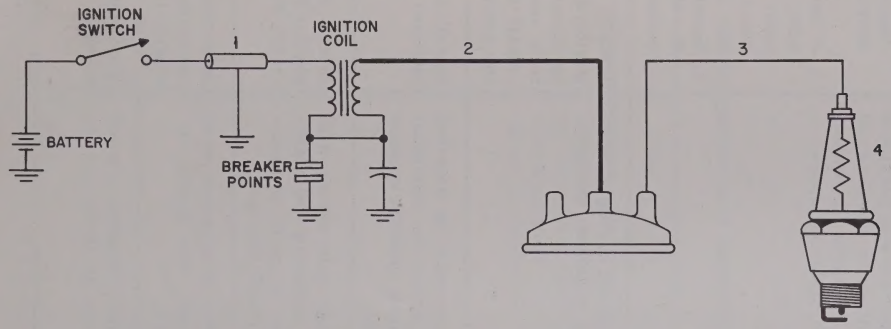
NOISE IDENTIFICATION AND SUPPRESSION CHART (Cont'd)

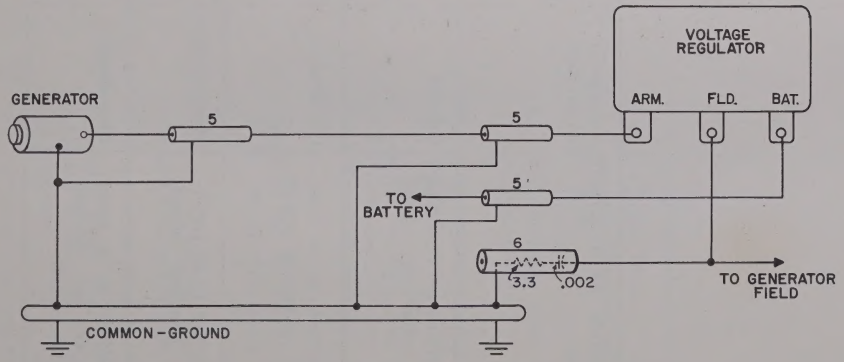
Characteristics of Noise at Speaker	Source of Noise	How to Check Source of Noise	How to Suppress Noise
			2. Bond each corner of the motor block to chassis ground using a heavy copper grounding braid. 3. Damp the high voltage by installing a resistor suppressor in the distributor rotor lead, or suppressors in the ignition cables or on top of the spark plugs. 4. Install resistor spark plugs or ignition cables.
Identified as a high pitched whine	Generator	Noise varies with engine speed and will persist if ignition is switched off while engine is running at a moderate speed.	1. Install a .25 - .5 mfd. coaxial capacitor at the generator in series with the armature lead. 2. A hand wound choke in series with the generator field has been used with considerable success. 3. Install a MOTOROLA Model P-346 Generator Filter in series with the armature.
Identified as a raspy sound	Voltage Regulator	Look for arcing of voltage regulator contacts.	Install .25 - .5 mfd. coaxial capacitors at the battery (BAT.) terminal in series with the battery lead and at the generator (ARM) terminal in series with the armature lead.
Identified as a hissing or crackling sound	Gauges	Noise may be detected by jarring the individual gauges while the ignition is on.	Install .25 - .5 mfd. by-pass capacitors where needed.
Identified as a low-pitch clicking sound	Oil Sender	Noise rate varies with oil pressure and stabilizes at point of maximum oil pressure.	Install .25 - .5 mfd. by-pass capacitor from gauge lead terminal on Oil Sender to chassis ground.
Identified as an irregular popping sound	Wheel Static	Noise disappears when brakes are lightly applied.	Install suitable grounding brushes or springs such as front wheel static eliminators.
Identified as a more regular or sharper popping sound	Tire Static	Noise becomes much worse at 30-50 m.p.h.	Use anti-static powder in tire tubes.

Typical Noise Suppression Detail
Motorola No. 69C854657-A
11/5/59-RCS

NOTES:

1. THE 0.1 UF COAXIAL CAPACITOR SHOULD BE MOUNTED AS CLOSE TO THE IGNITION COIL PRIMARY INPUT AS POSSIBLE.
2. EITHER A SUPPRESSOR CABLE OR A RESISTOR SUPPRESSOR IN THE DISTRIBUTOR ROTOR LEAD OR BOTH MAY BE USED ACCORDING TO THE REQUIREMENTS OR THE LIMITATIONS OF THE INDIVIDUAL INSTALLATION. SEE PARAGRAPH 5 OF THIS SECTION FOR FURTHER DETAILS.
3. EITHER RESISTOR SUPPRESSORS IN THE DISTRIBUTOR SPARK PLUG LEADS, OR RESISTANCE WIRES, OR RESISTANCE SPARK PLUGS OR ANY COMBINATION MAY BE USED ACCORDING TO THE REQUIREMENTS OR THE LIMITATIONS OF THE INDIVIDUAL INSTALLATION. SEE PARAGRAPH 5 OF THIS SECTION FOR FURTHER DETAILS.
4. THE 0.5 UF COAXIAL CAPACITORS SHOULD BE MOUNTED AS CLOSE TO THE GENERATOR AND THE REGULATOR AS POSSIBLE.
5. NOISE SUPPRESSION CAN BE ACHIEVED ONLY IF COMPONENTS ARE PROPERLY GROUNDED. BE SURE ALL COMPONENTS ARE PROPERLY GROUNDED.





TYPICAL NOISE SUPPRESSION DETAIL

THIS DIAGRAM IS A SUGGESTED NOISE SUPPRESSION SETUP. IT MAY BE USED IN ITS ENTIRETY OR IN PART, ACCORDING TO THE NEEDS OR LIMITATIONS OF THE INDIVIDUAL INSTALLATION. (SEE TEXT FOR COMPLETE INFORMATION.)

REF. SYM.	DESCRIPTION	PART NO.
1	*COAXIAL CAPACITOR, 0.1 UF	8B839908
2	*SUPPRESSOR CABLE	30A502396
3	RESISTIVE WIRE	SEE AUTO PARTS DEALER
4	RESISTOR SPARK PLUG	AUTO-LIGHT OR CHAMPION
5	*COAXIAL CAPACITOR, 0.5 UF	8K839909
6	*GENERATOR FIELD SUPPRESSOR ASSEMBLY (3.3Ω RESISTOR & .002 UF CAPACITOR)	1V80700A89

* THE TEN6018A NOISE SUPPRESSION KIT CONSISTS OF THE ITEMS MARKED WITH AN ASTERISK.